# RESTRUCTURING COMMUNITY IN THE FACE OF FOOD WASTE: NETWORK RESPONSE TO VERMONT'S UNIVERSAL RECYCLING LAW

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by

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# ABSTRACT

Vermont's Universal Recycling Law (Act 148) created a fresh set of opportunities as well as challenges for the rural state's businesses and residences alike. Enacted in 2012, this law was the first to ban statewide landfilling of recyclables and food waste, and in turn, disrupted status quo, and reconceptualized how Vermonters define 'waste.' In response, networks of food system and waste professions have emerged to restructure their community and waste system. This study explores those networks, and their horizontal governance structures, to understand their effects on the complex issue of food waste. Using two main networks, the Food Cycle Coalition (FCC) and the Solid Waste Implementation Advisory Committee (SWIAC), this study finds that elements of information exchange and inclusion of diverse perspectives exist that could lead to positive behavior change. Finally, this study recommends that municipalities adopt multi-level governance when enacting laws that shift behaviors, and makes a case for planners to recognize their role in the changing waste landscape.

## BIOGRAPHICAL SKETCH

Jac is a native of Western New York, with a long-standing interest in waste reduction and environmental conservation. Before pursuing her masters at Cornell, she received a Bachelor's degree in Music and Environmental Studies from Binghamton University, completed two years of service with AmeriCorps in Cape Cod, Massachusetts and Providence, Rhode Island, and worked her way through the food system by farming, processing hot sauce, serving in markets and restaurants, and working with Just Food on a farm-to-pantry program in New York City. Upon graduation, Jac will begin her food and waste system planning career working with the Addison County Solid Waste Management District in Middlebury, Vermont, where she will help launch their organics diversion program, as required by the subject of this thesis, the Universal Recycling Law.

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# INTRODUCTION

***"Waste itself is a human concept; everything in nature is eventually used."*** ***Peter Marshall***

On average 31 percent of our national food supply is wasted, which is equivalent to discarding: twenty pounds of food per person per month (Buzby et al. 2014), 25 percent of all freshwater (Hall et al, 2009), and $165 billion each year ("Obama Administration" 2015), and all while contributing 16 percent of the nationwide methane emissions from anaerobically digesting in landfills (Gunders, 2012). Staggering numbers such as these litter headlines and remind us of the critical need for solutions to the man-created problem of food waste. With the proliferation of global interventions, food waste is acknowledged as a key issue for addressing food insecurity, natural resource depletion, and climate change (Quested and Parry 2011; Neff et al. 2015).

The national news and recent initiatives and policy changes are not only illustrating our increasing awareness of the issue, but are also launching us into a nationwide paradigm shift, fundamentally changing how we conceptualize 'waste.' Similar to the 1970s when our recycling culture began, organic by-products are now being recognized as 'resources,' and discarding these products also discards other resources we value such as water, energy (including fossil fuels, solar, and labor), and money that went into their production (Steel 2013).

The causes of food waste are vast, however its generation in developed countries is generally related to consumer behavior (Halloran et al. 2014). Therefore in order to change how we as a nation waste, we must change how we consume. Municipalities have begun implementing programs to curb food waste behaviors, but this is very difficult for two reasons: (1) waste behaviors are engrained and reinforced daily by automatic internal and external processes, and (2) food waste is a complex problem. With regard to food waste, the concept of behavior change is as large as the scale of our global food system;

in order to change how we waste food, we must also change how we produce, harvest, process, distribute, store, sell and consume, food.

The Vermont legislature is the first and only legislature in the U.S. to enact a statewide law that bans the landfilling of food waste. In addition to being the first, this law is unique for its implementation in such a rural area[1], as most other policies surrounding food waste reduction are in densely populated cities (i.e. San Francisco, Seattle, Boston, Vancouver, and Portland). Implemented in phases, the Universal Recycling Law (also known as Act 148), will slowly ban more and more waste generators until 2020, when all businesses and residents will have to divert and separate their organics and recyclables (Vermont Materials, 2014). The mandate, which prioritizes alternative food waste options such as purchasing less, donating, feeding to animals, and composting or converting to energy, has restructured the current waste system. It has received both a good deal of praise, as well as backlash, especially from communities who do not wish to curb their usual behaviors, or from those whose livelihood depends on the waste stream. In response, a number of networks have emerged to engage with diverse food system stakeholders to reassign capacity and restructure how this community functions in order to rebuild the waste system.

This study explores those networks, and their horizontal governance structures, to see if they have been able to respond to the difficulties of changing waste behavior, and/or find solutions for the complex issue of food waste. Since waste is so complex, and a product of deep-seeded behavior, the question that drives this research is, what elements, if any, exist in networks that could improve waste behavior? I hypothesize that because networks engage with diverse stakeholders and community members, they have

[1] According to the 2014 Census, the population of the entire state of Vermont is 626,042, and calculations based on population density reveal that more than 95 percent of the state has a population density of 41 people per square mile. See Appendix C for calculations and population density map.

an important role to play in making sure the voice of the community is included in food waste reduction policy, and this voice will likely help make the policy more effective.

This paper uses the case of Vermont to present new evidence on how multi-stakeholder collaboration in networks can lead to positive effects on changing food waste behaviors. To explore this area of study, I conducted interviews with network organizers and participants of Vermont networks that focus on food waste reduction. In subsequent sections I analyze and discuss network contributions to solutions of food waste, highlighting their elements and effects on the changing waste landscape.

# LITERATURE REVIEW

## ***Out of Sight, Out of Mind: the Habitual Process of Oblivion.***

The act of disposing waste is a part of our everyday lives. This simple, habitual behavior is often performed without conscious effort (Comber and Thieme 2013), and therefore presents a significant challenge for food waste reduction efforts. Because our food and waste systems are so complex, the behaviors and practices of wasting are disconnected to their consequences (Quested et al., 2013), and as a result, awareness of the quantity and value of the food being wasted has been quite low, (WRAP, 2007) until recently. We are now well aware that food waste is a problem of a massive scale, contributing on average 31 percent of our global waste stream (Buzby et al., 2014) and threatening both our social and environmental systems (Buzby et al. 2014; Hall et al. 2009).

Our disposal culture was not always this way; rather it developed and shifted over time, often mirroring our consumption behaviors and the economy. Long connected to mankind's pursuit of development, waste was thought of as an inevitable precursor for growth (Kathiravale and Muhd Yunus 2008). At the same time, during tumultuous periods in our nation's history, food consumption and food waste generation were behaviors targeted for change. During World War I and World War II, the U.S. Food Administration launched a series of campaigns and posters through the Clean Plate Club that encouraged citizens to curb their current consumption behaviors, and promoted ways to use food as efficiently as possible (Figure 1) (Schneider 2013). Food was viewed as a resource; its nutrition was "necessary for fighting power," and because these wars enlisted so many men, "a lack of manpower occurred in agriculture" that was expected to cause food scarcity (*ibid*, X-6). We may no longer lack manpower, however an impending lack of resources and arable land (Stuart 2009) indicates that these messages are still relevant today.

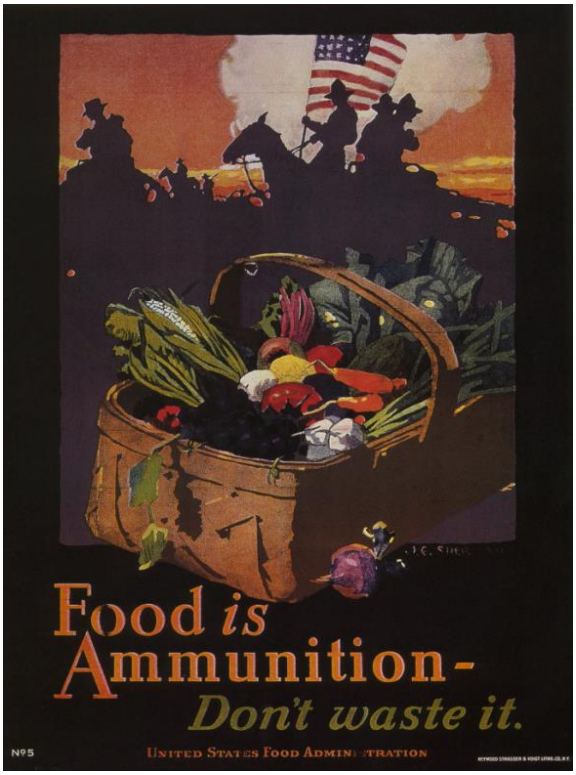



**Figure 1: WWI Poster, 1918, illustrated by John E. Sheridan**
*Source: http://www.hoover.org/news/recent-article-examines-herbert-hoovers-role-world-war-i-era-food-relief-efforts*

On a structural level, the habit of wasting food deeply pervades every facet of the food system (Griffin et al. 2008). Our food system is comprised of interconnected linkages, where food is passed from production to processing, distribution, retail, consumption, and ultimately ends as waste. Once thought of as linear (Figure 2), our food system is now understood as far more cyclical, with waste present throughout. As illustrated in Figure 3, organic products are fed back into the system, showing that organic "waste" still holds value.

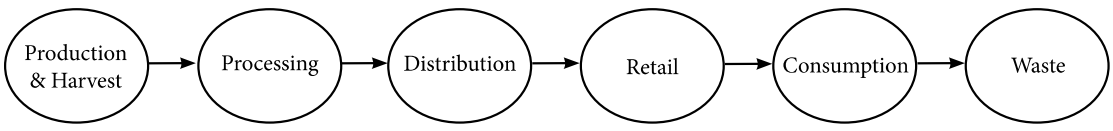



**Figure 2: Linear Food System**

Excess food has far more value when it is reused or recycled than when it is disposed. The causes of this waste are vast and can result from: ordering inefficiencies at the retail level, producers' lack of incentive to harvest, date label confusion, aesthetic standards, or processing snafus. The type of food waste that results from the issues above is coined as food *loss*, and is often still perfectly fine for consumption (Buzby et al. 2014; Venkat 2012). Other food waste not fit for consumption still holds value within its nutrient-dense matter and can either be converted into compost to amend and improve infertile soil (Stuart 2009) which preserves water (Bloom 2011), or the gases emitted during anaerobic digestion can be captured and used as energy (Iacovidou et al. 2012). Merely disposing of food takes this multi-faceted resource out of the system. To make matters worse, when food waste breaks down in a landfill the anaerobic decomposition releases methane, whereas compost piles breakdown aerobically and release carbon dioxide. Methane is a greenhouse gas that is twenty times more harmful than carbon dioxide in its effects on climate change (Venkat 2012). Throwing out food waste is in essence throwing out the solution to multiple problems, while exacerbating another.

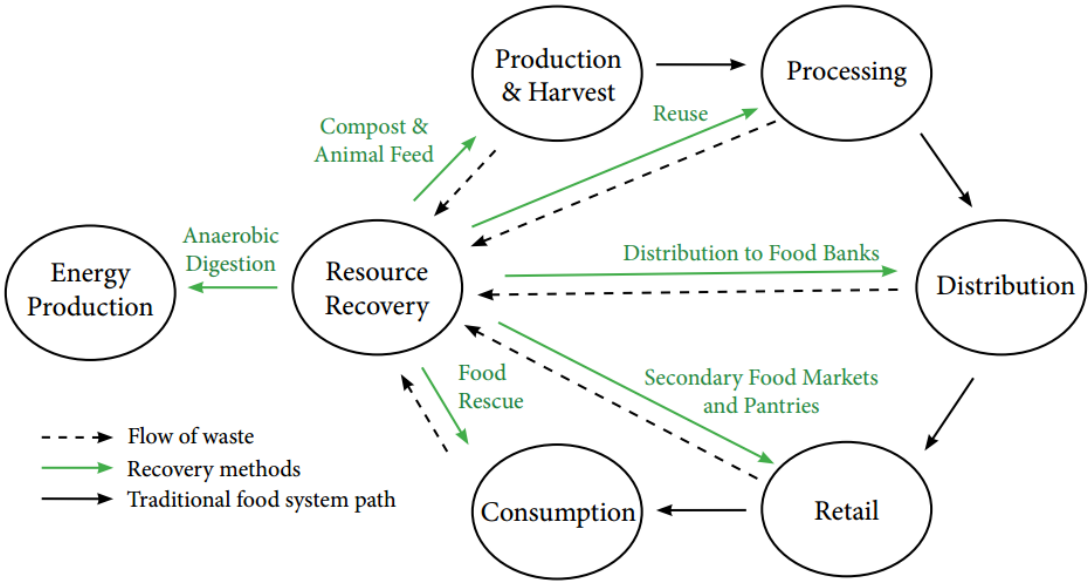



**Figure 3: Cyclical Food System**

According to a recent national consumer survey, the largest motivating factor for not wasting food is saving money (Neff et al. 2015). Yet U.S. consumers only spend on average 9.4 percent of their disposable personal income on food, whereas other developed countries spend an upwards of 40, and developing countries up to 71 percent of their wealth on food (Guptill et al. 2013). This suggests that perhaps the lowered portion of income spent on food in developed countries devalues it, therefore exacerbating the wasting of food (Steel 2013). This indicates an important distinction; that while the issue of waste is widespread, it is far more prolific in developed countries. Food waste in developing countries often stems from a lack of mechanisms to keep the food fresh, whereas food waste in developed countries relates more to consumer behavior (Halloran et al, 2014). The per capita food waste by consumers in developed countries is on average 250 lbs. a year, whereas consumers in developing countries waste on average 22 lbs. a year (FAO). This is but one of the many staggering estimates that illustrate the degree to which food waste has negative social impacts.

***Shifting Paradigms: "Waste is only waste if you waste it" – will.i.am***

When food scraps or excess products are only considered waste, they hold little value beyond their revenue for landfill collection, however as we have begun to see, the waste landscape is changing. A number of municipalities have either banned, or are working towards banning food from entering the waste stream. Domestic examples include the state of Vermont (Perry 2014), and cities such as San Francisco, Portland, Boston and Seattle to name a few (Bloom 2011). Furthermore, the USDA and EPA released the first nationwide food waste reduction goal of 50 percent reduction by 2030 (EPA, 2015), and just this past March ReFED released a report that outlined the economic feasibility of 27 organic waste reduction strategies that municipalities can implement in order to reach the 50 percent reduction goal (ReFED, 2016b). This report

was compiled using multi-stakeholder collaboration; a tactic that implementation scholars believe to be important for successful systems change (Rycroft et al., 2013). Many nationwide reduction tactics are recommended to follow the food waste hierarchy guidelines provided by the EPA, which illustrates methods of waste reduction, reuse or recycling in order of most preferred to least (Figure 4) *(*EPA 2015).

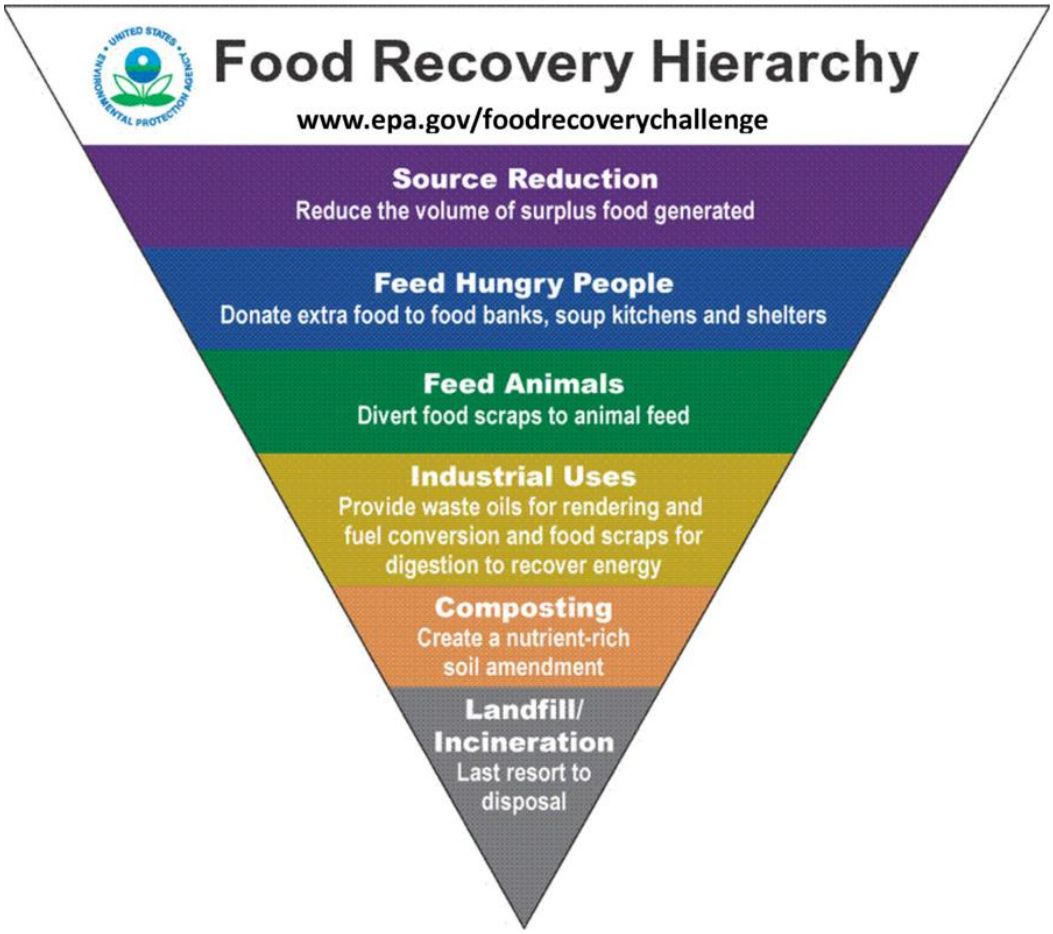



**Figure 4: EPA Food Recovery Hierarchy**
*Source: http://www2.epa.gov/sustainablemanagement-food/food-recovery-hierarchy*

What these examples illustrate is that whether fully realized yet or not, we have been launched into a nationwide paradigm shift that is fundamentally changing how we conceptualize 'waste.' In Vermont this shift happened fairly quickly because the Universal Recycling law redefined food by-product as a 'resource' (Vermont Materials,

2014). Even though the foundations of our bureaucratic systems are built on incremental change, this law was more revolutionary, and the following global examples highlight that sometimes it is the disruption in the status quo that leads to systemic improvements.

Author Carolyn Steel explains in her book Hungry City: How food shapes our lives, that Austria had little choice in their waste paradigm shift. In the 1980s the capital of Vienna had maxed out their landfill capacity. Forced to deal with the issue, they began diverting and composting their organic waste, recycling everything they could, and incinerating the rest (which now heats two-thirds of the city's homes). Because the city had no alternative, it experienced, "a seismic shift in thinking that has altered its entire relationship with waste" (Steel 2013, 280) viewing it as the resource (i.e. compost, energy and heat) it really is.

In Bogota, Colombia, a "paradigm shift" occurred when a number of "constitutional pronouncements" led to the recognition and remuneration of informal waste pickers as public employees for their collection, transportation, and management of recyclables (Parra 2013, 5). The waste pickers were informally collecting recyclables for more than 50 years, fulfilling a role that the cities' haulers were not, and allowed for the operation of over 1,500 recycling warehouses (*ibid*). Recyclables were recognized as resources that fed into the economy, and the waste pickers' remuneration for their acts illustrated that in fact one man's trash, is another man's treasure.

Paradigm shifts have been shown to advance the scientific community as well. Thomas Kuhn (2012) spoke of revolutions (i.e. the discovery of anomalies) as paradigms that change the rules of the game, and the way scientists perceive their research. Kuhn believes paradigms are common in the science world because they can be "more successful in solving a few problems" than incremental research, yet this comes with a caveat (Kuhn, 2012, 23). While paradigm shifts are necessary to enact large changes, the shift in thought needs to be backed by "reformulations" or revisions of the paradigm (33) in order to make the discovery relevant for the scenario at hand. In our case, this means

that a shift in food waste behavior can change mindsets and priorities, but revisions are important to make sure the changes are effective for their intended communities.

Even with hierarchies of priority and bans that should theoretically guide a waste paradigm shift, the path from disposal to diversion will not be easy. In addition to the extra effort to change deep-seeded waste behaviors, reduction also requires considerable funding for additional collection and transportation, infrastructure, storage, energy and labor (ReFED 2016b). Food is also perishable; therefore safe handling, timing and transportation will be important for rescue for secondary-market consumption (i.e. pantries, soup kitchens) (Buzby et al. 2014). Finally, multi-stakeholder collaboration is needed in all of the above issues, and any solutions or interventions in one part of the food system that do not include collaboration risk exacerbating the problem in other areas, potentially worsening the outcome for the entire system at large (Halloran et al. 2014).

The extra effort, coordination and financing required could potentially lead to counterintuitive initiatives. Given our current model for waste removal, the cost is shifted to the generator of waste through collection fees. However, if diversion of organic waste requires added effort, it should not also require additional payment. Instead of diverting money from our pockets, behavior change theory suggests that incentives must exist that make the changing of our current waste behavior *more* attractive (Michie et al. 2011), and one common way that municipalities have done this is to make it cheaper to divert waste (ie, recycling, donating, composting), than to dispose of waste. Yet low or nonexistent disposal fees will not cover the high collection costs, therefore it is unlikely that projects will survive without additional policy support (ReFED 2016). This brings us into a discussion regarding the role that interventions and policies can and should play with regard to the complex problem of food waste.

***Coordination in the Face of Complexity***

As illustrated above, food waste is a complex problem generated among intricate food system chains and processes. According to Kania and Kramer (2011), complex problems cannot be fixed when various stakeholders all attempt to solve the same issue in separate silos. This results in what they refer to as *isolated impact*, in that it sequesters potential collaborators. This also causes competition when funding is needed from limited sources. The nature of the food system and the potential cycle of waste within illustrate the need for collaboration. If efforts can instead be coordinated across multiple organizations and public and private actors, far more progress can be made towards solving complex problems. The impact that occurs when a group of influential actors across various sectors coordinate and collaborate is referred to as *collective impact* (Kania and Kramer 2011). Kania and Kramer (2011) highlight five conditions that must exist for collective impact to occur: a common agenda, shared measurement, mutually reinforcing activities, continuous communication and backbone support organizations (Figure 5). Hanleybrown et al. (2012) also highlight three preconditions that are needed before a collective impact initiative begins which are: an influential champion, adequate financial resources, and a sense of urgency for change. These elements and preconditions can help evaluate the collaborative efforts of partnerships or networks focusing on complex problems (i.e. food waste reduction), and can elucidate where efforts could be improved.


**Figure 5: Collective Impact Framework**
*Source: http://www.uwsummit.org/collective-impact*

The collective impact framework has been utilized to create and evaluate collaborative efforts within the food system (Perry 2014), however, it has not been used in direct relation to solving the complex issue of food waste.

At the core of food waste reduction lies behavior change, for no policy or top-down approach can be successful if it does not change current waste behaviors. Michie et al. (2011) state that behavior change is influenced by three components: ***capability, opportunity*** and ***motivation*** (Figure 6). Intervention strategies that wish to change behavior must therefore improve all of these components. Individuals can become more *capable* of changing behavior through gaining knowledge on the issue. They will have more *opportunity* to change behavior if their environment and outside factors encourage them to do so. Finally, individuals are more likely to change behavior if they are *motivated* to do so, and feel connected to the community driving the change.


**Figure 6: Wheel of Behavior Change Conditions**
*Source: Michie at al. (2011, pg. 7)*

These components appear to connect to both the conditions of collective impact, as well as the issue of food waste in two ways. First, collective impact elements are often necessary for group collaboration or coordination (Kania and Kramer 2011). Collaboration requires effort and exists when individuals *choose* to behave cooperatively (Pruitt 2013). Therefore individuals may change their behavior in order to contribute to the greater whole of a group, and the three main elements that Michie et al. (2011) observed (i.e. capability, opportunity, motivation) might be important explanatory variables for achieving collaboration. Furthermore, focusing on the issue of food waste is new for many professions, and means that behavior change is likely as important as collective impact when it comes to stakeholder collaboration.

Tackling the issue of food waste requires behavior change on a towering scale, for everyone contributes to waste generation. As Michie et al.'s (2011) theory suggests, if implementation strategies result in better informed and engaged citizens who have convenient diversion options, then they should theoretically succeed in proper food waste reduction. Planning these implementation strategies will likely require the coordination of many if not all diverse stakeholders within the food value chain. Having multiple frames

of reference on the issue will afford actors within the system the opportunity to understand the structure behind food waste and how these links function. Information is critical, as each link in the food system is comprised of professions that function with their own processes, needs, abilities, voices and interests; all of which need to be understood and valued for consensus to be reached. These transactions of information increase trust, reciprocity and coordination, and are also known as forms of social capital (Ostrom 1994). ***Social capital*** is often coined as the glue that holds a community together, and has been found to improve performance among diverse groups and enhance community-driven work (Potapchuk et al., 1998). It is usually found in two forms: localized or bonding, which is the capital accrued within families and close neighborhoods, and generalized or bridging, which spans or "bridges" social and physical boundaries (*ibid).*

Previous literature on collective impact, behavior change and social capital illustrate the potential for coordination in overcoming complex tasks (Jones et al, 1997; Kania and Kramer 2011; Salamon 2002). The following section elucidates how multi-stakeholder networks are, in theory, attractive formations for coordination and implementation of positive systems change.

### ***Networks and their Horizontal Governance Structures***

Generally defined, networks are interconnected systems or groups of people who work together, and have been recognized for their effective forms of governance within multi-stakeholder groups across industries (Provan and Kenis 2008; Jones et al 1997; Slater 2007). Focused on cooperative endeavors, networks are coined advantageous for many reasons, including their efficient use of resources, enhanced inclusion and flexibility, and ability to address complex issues that demand multilateral coordination (Provan and Kenis, 2008; Alter and Hage 1993; Brass et al. 2004; Huxham and Vangen

2005; Powell 1990). Organizations choose to join or form networks for any number of reasons but regardless of intent, the underlying assumption exists that networks have the capacity to achieve more than individual actors could alone (O'Toole 1997).

Despite the praise, some authors question network ability to overcome inefficiency without having implications on equity (Goodman and Pennings 1977), while others question the legitimacy (Human and Provan 2000) and stability (Provan and Milward 1995) of network structures, and their governance. Network structures are by definition more horizontal, flexible and decentralized forms of organization where social interactions undergird network functionality (Reagans and McEvily 2003). Network governance is defined as the coordination within these structures that is increasingly used to address complex issues or services (Jones et al. 1997; Larson 1992). The structure of the network essentially informs what type of governance will be effective. The following sections illustrate further why structure and governance factor into network effectiveness.

Whether a network is effective or not, and for whom, in part depends on the structure of the network itself (Slater 2007), as well as the structure of network governance (Jones et al. 1997). Structures vary depending on the issues they attempt to address and the more complex the issue, the more stakeholders will need to be present, which will in turn increase the variation, and difficulty of arriving at successful governance (Salamon 2002). An example of waste management illustrates when diversion is encouraged, waste networks diversify (Slater 2007). The governance structure of solid waste management involves multiple levels of government as well as private service providers, businesses and households; this indicates governance complexity even before considering food waste diversion. Therefore, adding in the separation and diversion of food waste within the network introduces an even wider array of actors, such as farmers, food rescue programs, food retailers, restaurants and energy companies (Slater 2007). This change in the membership will in turn change what type of governance will be effective.

In general, networks are known for their more horizontal governance structures (Larson 1992). These horizontal structures can encourage equal involvement of participants, build community capacity, and result in a more sincere and steadfast participant commitment to network goals (Chaskin 2001). They also breed varying patterns of relationships (Mills et al, 2014), and are better equipped to build relationships than hierarchical governance structures because, as Salamon (2002) points out, relationships are more like webs than hierarchies. Finally, horizontal structures are effective in overcoming the inefficiencies often associated with bureaucratic hierarchies, as well as the problems of inequality and exclusion arising from competitive markets (Giddens 2013). This network aspect is what I wish to explore more during interviews with Vermont network organizers and participants.

Beneficial as they may be, horizontal networks have their own host of limitations. According to Provan and Kenis (2008), networks must respond to issues of internal and external legitimacy, and find the balance between flexibility and stability, and efficiency and inclusiveness. Forms of horizontal coordination often require collective action, which is more difficult to attain in certain circumstances, such as larger group size. Furthermore, network formality may vary, and in the cases when conformity to rules is purely voluntary, accountability issues may arise. Gould (1993) believes that in order to hold individuals accountable, network density is key. If a network is dense, then acts within the network will have far greater impact on others, and will more efficiently galvanize others to commit. Jones et al. (1997) add that "structural embeddedness," or the extent to which individuals feel connected to one another in a network, will directly impact the information that moves throughout the group (913). The more embedded, the faster information is dispersed, and the faster trust will build based on reputation and repeated interactions (Jones et al. 1997; Powell 1990; Ostrom 1994).

***Horizontal versus Hierarchical Governance***

As the previous studies suggest, the horizontal governance structures of networks may have something to offer food waste reduction initiatives. The hierarchical governance structures that have imposed waste bans and laws both nationally and globally have succeeded in shifting the paradigm from waste to resource, however they do not necessarily encourage community coordination that I argue will be necessary to follow through with the changing waste landscape. While difficult to control with larger group sizes and complex issues, inclusive group density in networks allows for higher levels of collaboration, more continuous communication and ultimately, a greater collective impact (Kania and Kramer 2011) to help further network goals. Furthermore, if a goal is to implement programs or policy change, Rycroft-Malone et al. (2013), and Homsy and Warner (2013) advocate for directly integrating implementation roles within the planning process in order to both create local applied knowledge, and improve the potential for solution acceptance and compliance. Both of these aspects will be easier to use if and when a network moves from plan to action. Homsy and Warner (2013, 301) call for "co-production" which involves knowledge exchange flowing from both top-down (i.e. hierarchical) and bottom-up initiatives, which in this case, are our networks (301). Additionally, horizontal structures' such as networks have the ability to create a "cascade effect" on other individuals not within the group itself (Quested et al. 2013, 49), meaning that individuals within the networks can directly pass along what they have learned and created, which might have more impact on raising awareness and increasing motivations than general waste reduction awareness campaigns. These steps of collaboration are largely overlooked when hierarchical governance structures impose change (O'Daniel and Rosenstein 2008). Weaving together previous literature, it seems that hierarchical and horizontal governance structures have overlapping interests, and complimentary strengths, and should therefore work together when solving complex

issues like food waste. Complimented by aspects of collective impact and behavior change, I will explore how networks use their horizontal governance structures with the intent of improving the waste landscape, and aiding in statewide knowledge exchange and relationship building.

## ***Previous Studies on Food Waste***

The literature on food waste initiatives in the context of network mechanisms is rare. Researchers have done a great deal of work on food waste, and focus their studies on: the economic benefits of composting (Arancon et al. 2004); nutritional content of wasted food (Griffin et al. 2008); the varying perceptions of waste (Neff et al. 2015; Kathiravale 2008; Secondi et al. 2015); and societal aspects that lead to it (Evans 2011) to name a few.

In terms of behavior change, a few studies have focused on the behaviors causing waste (Neff et al, 2015), as well as models that might help change waste behaviors (Quested et al. 2013). There are overlapping theories regarding which elements exist in the behavior change realm, but generally include knowledge, motivations or incentives, and ease of action, lowered barriers (Michie et al 2011; Quested et al. 2013; Secondi et al. 2015). Research on food waste prevention has found that better information, such as how to interpret best-by-dates, as well as storage and preparation, can increase reduction potential (Secondi et al. 2013), while others conclude that the provision of information alone will not elicit a substantial enough change in waste behaviors (Quested et al, 2013). Much of the work on waste behavior focuses on the individual and household levels, however I am curious to understand how groups or networks in the waste system might affect thoughts and behaviors surrounding waste.

Less studied is how we as a community at large use the knowledge of the public to build community capacity and propose plans for implementation. Yet, it is important to

focus on such collaborative endeavors that are attempting to move past antiquated ideas of excess food as "waste," to a future classification of "resource." There are a lot of moving pieces, professions, and people both within the food and waste systems (including generators of waste), that need to recognize and adopt this new ideal in order for it to work on a grand scale. Halloran et al. (2014) analyzed how different stakeholders in Denmark address the issue of food waste, and called for multi-stakeholder collaboration. In this study with Vermont, we can respond to the above notion and illustrate how these horizontal, multi-stakeholder collaborations are impacting the changing waste landscape.

One study that gives weight to planning and implementation on a community level is by Evans-Cowley and Arroyo-Rodriguez (2013), and focuses on food waste planning for the Mississippi Gulf Coast. In it, they discuss how the profession of planning is well equipped to develop effective plans and implementation strategies to manage food waste and argue that appropriate solutions for food waste management would emerge far easier if food system planners and solid waste management planners were engaged jointly in the planning for food waste. Planners' traditional involvement in both economic development and land use puts them in good position to foster interactions between these two sectors.

Evans-Cowley and Arroyo-Rodriguez (2013) began and monitored a multi-stakeholder planning process, identifying new partnerships that could help push the needle forward, but they were unable to assess the groups' effects because the stakeholder group was newly formed and only met twice for brainstorming sessions. This is where a Vermont case study can advance the research. Act 148 passed in 2012, and stakeholder networks that are planning food waste reduction strategies have been meeting quarterly for close to three years by mid-2016 when I completed my survey work. Theoretically the Vermont networks' meeting structure and planning processes should be able to add to the insight gained in the Mississippi Gulf Coast study.

What this synthesis of previous studies suggests is that similar conditions are deemed effective for both network governance and for solving complex problems. A follow-up question then becomes, what elements of governance are necessary in order to create solutions for a complex problem such as food waste? Here is where I hope to add to the growing literature on the topic of food waste, exploring the elements within the horizontal governance structures of networks to see what will bode well for food waste reduction in the near future.

# METHODOLOGY

The main question that drives this research is: what elements, if any, exist in these Vermont networks that could lead to improved waste behaviors? This question came to fruition through key informant interviews, and differed from my original inquiry, which was aimed at how networks were effective in implementation of food waste reduction initiatives. During interviews I quickly learned that implementation is still a few years off. Act 148 passed in 2012, and I incorrectly assumed that three years was enough time to plan new initiatives, implement, and evaluate. Previous studies lauded networks' horizontal governance structures for their efficiencies, compared to that of hierarchical governance (Chaskin 2001), but more efficient than bureaucracy does not indicate exactly how long networks should take to come to consensus, plan and act. The more complex the issue, the more stakeholders are required (Salamon 2002), and for good reason. When attempting to solve a problem as complex as food waste, networks will need to include diverse stakeholders, many from professions that had never worked together prior to joining the network. Their unique pieces of the food or waste system have their own processes, language and learning curves, which means the first order of business for any successful network must be to create a common language. The more diverse the group, the more time this will take, but the more necessary it becomes. I did not anticipate the additional steps, but learned that the insight gained from participants taking the time to understand one another results in a richer planning process, and hopefully a more successful implementation. Therefore, while it is too soon to measure implementation effects, I can still assess whether networks have the proper mechanisms that will have positive effects on the waste landscape.

In order to assess network effects, I chose to interview key informants of various networks of Vermont's food waste system. Individuals included network organizers, network participants, and others who were identified to offer insight on network effects

(Table 1). They were first contacted through email (see Appendix B for consent email), and then interviewed in person or over the phone. Respondents were purposely sampled and mostly identified through snowballing. The following tables illustrate the professions, establishments and networks represented from the 15 individual interviews. In addition, I note food system professions were not present in networks and therefore not interviewed.

**Table 1: Interview Respondents and Networks**

| **Interview Respondents** | **Totals** |
|---|---|
| Number of Interviews | 15 |
| **Role in Networks*** | |
| Participant | 7 |
| Organizer | 7 |
| Not in Network | 2 |
| *Total* | 16 |
| **Networks** | |
| Bennington County Solid Waste Alliance<br>Farmland Access and Stewardship Working Group<br>Food Cycle Coalition (FCC)<br>Northwest Vermont Healthy Roots Collaborative<br>Solid Waste Infrastructure Advisory Committee<br>Vermont Gleaning Collective<br>Vermont Solid Waste District Managers Association (VSWDMA) | |
| *Total Number of Networks* | 7 |

* One respondent is and organizer in one network, and a participant in another

**Table 2: Professions and Establishment Representation Along the Food System***

| *Production* | *Distribution* | *Retail* | *Waste* | *Resource Recovery* | *Other/ Administrative* |
|---|---|---|---|---|---|
| **Professions** | *(n=17)* | | | | |
| Farmer | Executive Director | Restaurateur | Chief Operations Officer | Composter (x2) | Environmental Analyst |
| | | | Hauler | Executive Director | Executive Director (x2) |
| | | | Planner | Gleaning Coordinator | Planner |
| | | | | Program Coordinator | Program Manager (x2) |

| *Production* | *Distribution* | *Retail* | *Waste* | *Resource Recovery* | *Other/ Administrative* |
|---|---|---|---|---|---|
| **Establishments** | *(n=14)* | | | | |
| | Vermont Food Bank | Skinny Pancake | Chittenden County Solid Waste District (CSWD) | Chittenden County Solid Waste District (CSWD) | Lamoille County Planning Commission (LCPC) |
| | | | Bennington County Regional Commission (BCRC) | Bennington County Regional Commission (BCRC) | Vermont Agency of Natural Resources |
| | | | Northeast Kingdom Solid Waste Management District (NEKWMD) | Northeast Kingdom Solid Waste Management District (NEKWMD) | Northwest Vermont Healthy Roots Collaborative |
| | | | | Intervale Center | Intervale Center |
| | | | | Composting Association of Vermont (CAV) | |
| | | | | Salvation Farms | |
| | | | | TAM Organics | |
| | | | | Grow Compost | |
| | | | | Willing Hands | |
| | | | | Vermont Food Bank | |

*No respondents were from establishments in processing, or energy production, and nor were they strictly consumers with no professional attachment to food waste reduction.

**Interview format and composition.** The format for data collection was an interview comprised of 15 questions (See Appendix B for interview questions). Questions were organized into five categories: (1) Network history and participant involvement, (2) Conditions for collective impact (i.e. common agenda, consistent communication, backbone organization support, and information sharing), (3) Network effects, (4) Barriers and conflicts, and (5) Conditions for behavior change (i.e. capacity, opportunity, and motivation).

My first few questions served as background, and allowed participants to ease into the interview before answering more tedious questions. Depending on how and when the network formed, I could frame the rest of the interview to that particular network. Additionally, I was interested to hear about interviewees' motivation behind participating. Understanding what incentives are available, or what is important to the interviewee could also affect how they perceive network effectiveness and barriers.

The subject of food waste is complex, and previous studies on overcoming complex problems discussed network ability through multi-lateral coordination (Provan and Kenis, 2008; Huxham and Vangen 2005; Powell 1990), and also identified a group framework for overcoming complex problems called collective impact (Kania and Kramer 2011; Hanleybrown et al, 2012). I was curious to know if the Vermont networks focusing on food waste reduction contained elements necessary for collective impact, and if these conditions enabled the networks to be effective in achieving their goals, or if the issue of food waste presented unique barriers and conflicts. Therefore I chose to ask questions about network effects, barriers and conflicts, as well as conditions of collective impact.

During review of previous literature relating to behavior change, I came across Michie et al.'s (2011) wheel that explains three important factors that must improve in order for behaviors to change: capability, opportunity and motivation. This model was made with regard to implementing behavior change interventions such as tobacco control

and obesity (Michie et al. 2011). I grew curious to know if the same ingredients applied to networks, and more specifically those focusing on food waste reduction. I chose to include questions regarding the individuals' perception of the networks' proven ability to increase the knowledge around the topic of food waste (*capability*), lower environmental barriers (*opportunity*) and increase *motivation.* Finally, in order to identify other networks and individuals that are instrumental in the food waste reduction efforts in Vermont, I asked participants for names of others who could contribute additional insight.

**Data collection and integration.** Primary data was collected by phone or in person. Observational data was also collected during a Food Cycle Coalition (FCC) meeting on January 15, 2016. Additional research includes secondary sources, such as documentation from networks, which serve to contextualize the data acquired through interviews and observations. All interviews were audio-recorded, and transcribed verbatim. From the transcriptions concepts were identified and key themes emerged.

Before discussing the results, I will provide background on the case of the Vermont Recycling Law. This section will frame the landscape where networks have emerged and allow for network analysis in subsequent sections.

## ***Case Background: Vermont Networks in the Shadow of the Universal Recycling Law***

Vermont is no stranger to the importance of cooperation and coordination surrounding the challenges of waste management. The first statewide solid waste management law (Act 78) in Vermont passed in 1987 with goals of waste reduction and diversion, and a hope to make generators of waste pay user fees that "reflect the real costs to society of waste management and disposal" (Rosenberg Shak, 1987, 6). This law heavily prioritized cooperation and required municipalities who wished to apply for waste planning grants to either join or participate in solid waste districts (SWDs) that were coordinated with regional planning commissions, or participate in a regional

planning commission's solid waste planning effort. Today this district structure is still the main player in the waste management scene (see Appendix A for statewide map of SWDs), however their rates of waste reduction plateaued around 30 percent, and Vermonters continue to throw away over 400,000 tons of materials each year ("Vermont Agency" 2011).

To promote more diversion, the Vermont legislature unanimously passed The Universal Recycling law (adopted as Act 148) in 2012, and as the name suggests, this law seeks to establish universal recycling of solid waste. As of July 2014 they began phasing out the landfilling of materials such as recyclables, food waste and yard debris, with the goal that these will all be banned by the year 2020. In addition to the bans, this law incentivizes diversion behavior through two main requirements: 1) a variable or "pay-as-you-throw" pricing, and 2) "parallel" collection, or collection of all banned materials at the same location as trash collection ("Vermont Materials" 2014, 3). Parallel collection will be required for every hauler and solid waste district in the state. This has proven difficult for haulers and districts alike, as parallel collection requires extensive additional costs, and the legislature does not financially support any of the law's requirements. Seeing as how budgets often reflect values, Vermont's lack of budgetary funds towards this law makes it difficult to believe that the state legislature actually values waste diversion and reduction.

The law prioritizes the management of food scraps in similar order to the priority uses laid out by the EPA hierarchy (Figure 7), and mandates that municipalities at a minimum convene an advisory committee composed of citizens and businesses to provide guidance on the development of implementation plans that prioritize the hierarchy (Appendix D).

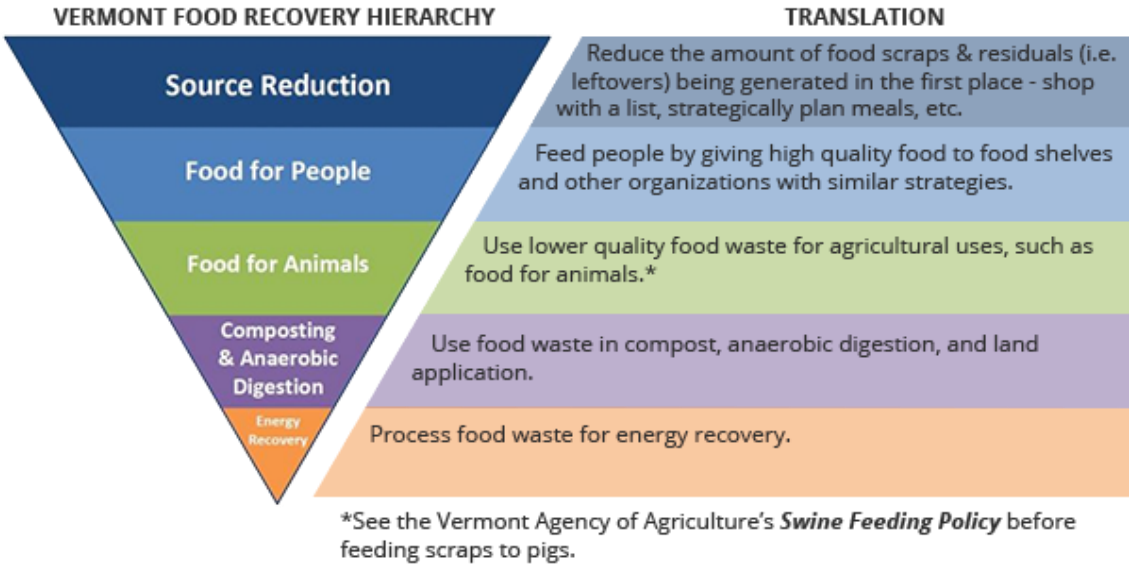



**Figure 7: Vermont Food Recovery Hierarchy**
*Source: http://cswd.net/reduce-and-reuse/reducing-food-waste/*

The Agency of Natural Resources (ANR) was tasked with creating a Materials Management Plan (MMP), for which they convened a stakeholder Solid Waste Working Group (SWWG) to come up with a list of recommended action items in order to accomplish the goals set out in the MMP. These guidelines, as well as a clear description of how to achieve and measure these goals must be accounted for in each individual municipality's Solid Waste Implementation Plan (SWIP). Past Vermont statutes regarding waste diversion required a SWIP but did not enforce that solid waste districts implement their plans; therefore, this new law has included evaluation and monitoring responsibilities to ensure action. Additionally, ANR integrated throughout the MMP the importance of maintaining and bolstering existing partnerships as well as fostering new ones (For more language on Act 148, see Appendix D). In response to the mandate, a number of diverse partnerships have taken to tackling the issue of food waste.

There appear to be hints of co-production between the hierarchy and horizontal networks through state agencies, however, the language of the Act 148 is quite directive, leaving little room for community or implementer input thereafter. Michie et al. (2011, 6)

explains that, “policies can only influence behavior through the interventions that they enable or support,” and Homsy and Warner (2013, 292) argue that linking the knowledge of local stakeholders to policies will lead to more effective policy action “that is owned and respected at the local level”. Tying these two theories together, in order for policy to cause successful waste behavior change, it must be informed by local stakeholders. I therefore argue that local input and local action are crucial in food waste reduction.

Using the components of behavior change outlined by Michie et al. (2011), I aim to find examples of network elements that could improve waste behavior. I believe that because networks engage with diverse stakeholders and community members, they have an important role to play in making sure the voice of the community is included in food waste reduction policy, which will likely improve policy effectiveness. Before assessing how networks could improve waste behavior, we must first understand the current effects of the law.

## ***The Lay of the Waste Landscape: Effects of the Universal Recycling Law***

Act 148 breathed life into the statewide discussion of food waste and has forced many businesses and professions to participate in reduction. The requirements imposed have lowered the amount of organic waste going to landfill, increased the amount of donated food by 30 percent, and diverted the resource of food waste to other means such as chicken feed, compost production, and anaerobic digestion (Bodette 2015). In other words, Act 148 may in fact help to reduce environmental strain, reduce acute hunger, and diversify the local economy.

As mentioned before, the law caused a paradigm shift that is forcing Vermonters to re-conceptualize excess food ‘waste’ as ‘resource.’ This shift did three things to the landscape. First, it dismantled the waste systems, as explained by FCC network organizer Pat Sagui:

> *Trash removal is a public service, our municipalities have statutory obligations, [but now] they're jiggering that in new ways…so who owns what piece? It's all up for grabs and that's part of the challenge…[The system is] totally dismantled and we're rebuilding it, reassigning capacity to manage the material. So you're working with a pretty defined legal structure and yet the legislation totally dismantled the structure within it and the state is telling everyone, alright figure it out, do it different.*[2]

Pat's words paint both the struggle and the opportunities presented by the law. While the goals are indeed difficult to attain, shaking the structure could expand or reassign capacity, enabling unlikely champions to emerge and take over pieces of the waste stream, or enabling diversification of the hauling profession.

Second, the law's disruption applied pressure to the food and waste systems, in a sense pushing disparate stakeholders together to engage and deal with their new common pool resource problem. The law introduced new priorities requiring waste diversion, which brought together individual missions, and encouraged collaboration. Much of this collaboration happened in newly formed networks.

Third, through dismantling the system, alternative diversion options emerged. Guided by the EPA food waste hierarchy, the law prioritizes source reduction and feeding people with safe excess food, before feeding animals, converting it to energy, or composting (Vermont Materials, 2014). As with many other aspects of this law, this creates opportunities for some, and challenges for others. The social opportunities that stem from a 30 percent increase in donations directly challenge the financing of large scale composting infrastructure investments, which have seen their food waste supply disappear.[3] Part of this issue is that the waste data reports that many composters, haulers and anaerobic digestion facilities relied on for supply estimates, could not realistically estimate how much of the waste supply would go for what purpose. The law provides the EPA food waste hierarchy as a guide with little directive. Because there are so many

[2] Interview with Pat Sagui, FCC

[3] Interview with Trevor Mance, SWIAC

options, this waste landscape is still in fluctuation as the community tries to figure out how much waste will be allocated where. Pat from the FCC explains this as the "*evolving structure of how communities function*,"[4] and unfortunately, as this law has shown, there will likely always be winners and losers.

Let us now sort through the other implications of the law. The law did not take into account the rural nature of the state[5] when it imposed parallel collection requirements. Economies of scale are difficult or impossible to achieve in most of the state, and the environmental benefits of collection may be offset by environmental costs due to increased truck travel. The law also gave no financial support to those who would need to spend millions of dollars in order to comply (i.e. haulers). Additionally, environmental limitations exist, such as the inconsistency of services throughout the solid waste districts. Inconsistency leads to confusion, frustration, apathy, and improper sorting. Improper sorting leads to contamination, which ruins machinery, degrades compost quality, and introduces the threat of organic farmers losing certification from the use of contaminated compost. To further illustrate these trends, Table 3 offers a partial list of the benefits and costs associated with Act 148, as well as the actors along the food system who are impacted.

[4] Interview with Pat Sagui, FCC

[5] The population density within more than 95 percent of the state is 41 people per square mile. See Appendix C for calculations and population density map.

**Table 3: Benefits and Costs Associated with Act 148**

| **Benefits** | **Costs** |
|---|---|
| *Additional Benefit* | *Additional Cost* |
| Less waste in landfills | Administrative costs for all solid waste districts |
| National attention for Vermont's progressive law | Administrative costs for the state |
| More food to food banks and pantries | New trucks, additional fuel and labor for haulers due to parallel collection |
| Environmental benefits | Environmental costs with increased truck travel |
| Increased compost production | Increased waste hauling costs for businesses and residences |
| Increased energy production | Increased issues with reluctance and contamination |
| *Loss of Cost* | *Loss of Benefit* |
| Less waste hauling costs for food retailers | Loss of landfill input (revenue) for haulers |
| | Loss of input and revenue for composters due to food waste hierarchy |

This landscape of a dismantled system with invisible borders of disparate rules, requirements that lack economic feasibility and all the confusion and contempt that follow, is where networks have taken root. Some were in existence prior to Act 148 and have since expanded their focus to include food waste reduction, while others, including the two in our cross-case analysis, emerged as a result of the law. Either way, these groups know that the waste landscape is certainly ripe for improvement, and they believe that collaboration can be the plow that shapes and cultivates the new wasteland.

## FRAMEWORK FOR ANALYSIS

At the onset of data collection, I expected to study outcomes of network reduction implementation, but soon realized that the role of networks is a more pertinent feature for analysis at this time. Through interviews, common themes quickly emerged regarding the fundamental roles of networks in readying the landscape for statewide waste reduction. Their horizontal governance structures enable both information exchange and inclusion of diverse perspectives (Provan and Kenis, 2008), and I gathered from the data that these elements are foundational for network effects. This caused me to hypothesize that through information and inclusion, food waste networks could have primary and secondary effects. In order to organize the interview responses to show these elements and effects, I have developed a framework for analysis in the form of a Network Pyramid (Figure 8).

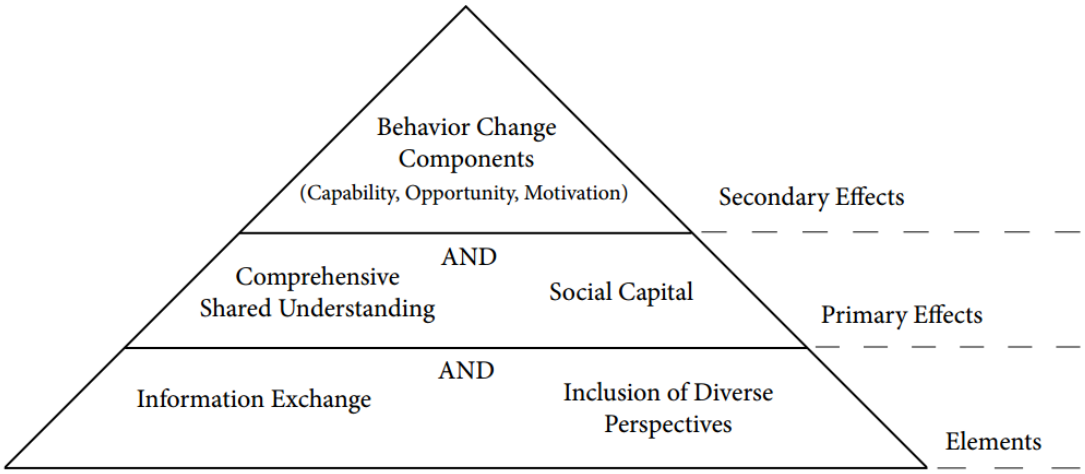



**Figure 8: Pyramid of Network Elements and Effects (Framework for author analysis)**

For the purposes of analysis, information exchange is defined as the sharing of *any* information during network meetings, which includes but is not limited to knowledge, stories, issues or insights. Inclusion of diverse perspectives is defined as the action or state of including a range of stakeholders and voices within the structure of the network.

Through this framework I will show how network information exchange and inclusion could lead to effects that I believe will be helpful in changing widespread waste behavior. The primary effects I will analyze are:

(1) A comprehensive shared understanding of the issue of food waste; and
(2) Social capital, defined as the building of new relationships that will enable action when other forms of capital are low (i.e. financial) (see Figure 9).

These primary effects could then lead to secondary effects, in the form of behavior change improvements. Once again, the components of behavior change are capability, opportunity and motivation (Michie et al. 2011) (see Figure 10).

Direct quotes from the 15 interviews as well as the FCC meeting in January will provide a breadth of perspective on the pyramid above. Using these individual stories and descriptive statistics below, I will then parse out elements and effects to illustrate how networks may have much to offer food waste reduction policies and programs.


**Figure 9: Results, Funding Needs**

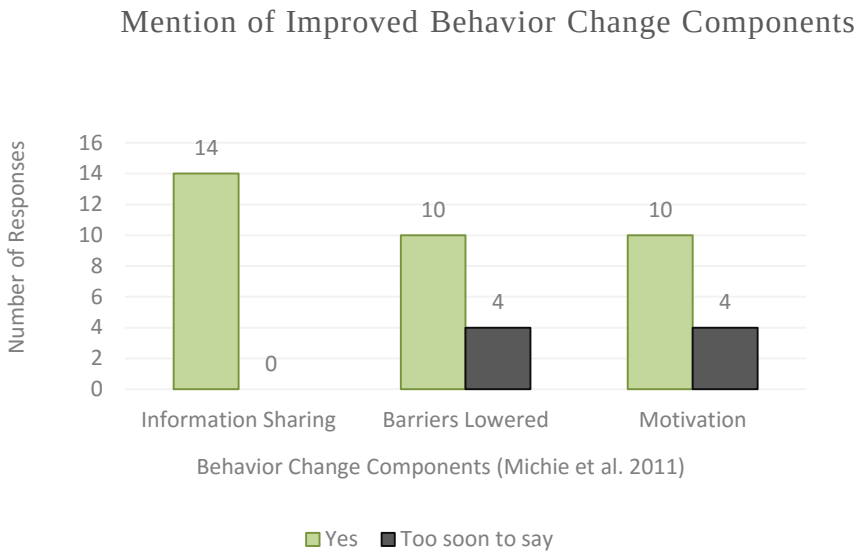



**Figure 10: Results, Responses Indicating Whether Behavior Change Components Have Improved Due to Networks**
(N=14; one participant has never been involved in a network)

## ***Cross-Case Analysis***

Using the Pyramid of Network Elements and Effects I will illustrate how networks interact with the changing waste landscape in Vermont. During data collection, two networks emerged as providing deeper analysis of network effects and for this reason, I will highlight the following networks for cross-case analysis: The Food Cycle Coalition (FCC), and The Solid Waste Infrastructure Advisory Committee (SWIAC). Every respondent regardless of network informed the research that led to the pyramid, and his or her voices will also enrich the analysis, but for the purpose of a cross-case analysis, I will mostly use the FCC and SWIAC. Both of these networks formed after the passing of Act 148, however they were fashioned under different pretenses and vary in many ways, which will unfold shortly. These differences illustrate that there is a range of networks that could inform the changing waste landscape.

**The Food Cycle Coalition (FCC).** Pat Sagui from the Composting Agency of Vermont (CAV) formed the FCC along with five other groups statewide[6] in the fall of 2012. The formation of the FCC was organic and voluntary, and the network began as a platform to simply talk about and prepare for the statewide shift that was beginning due to Act 148. The FCC is now comprised of 30 organizations and individuals "committed to building healthy and resilient communities where no one is hungry and no resource is wasted."[7] Their goal is to help Vermonters transition from "waste disposal" to organic "resource management" through assisting the development of programs and services for food rescue and organics diversion.

In many ways the FCC is a paragon of a diverse network. Members of the FCC include educators, researchers, composters, solid waste district managers, gleaners, environmental analysts, food bank employees, farmers and agency representatives. These professions make up many facets of the food system, yet the FCC does not have representatives from the processing, retail, consumption, or energy production professions (see Table 3). The network sits within the backbone organization of the Farm-to-Plate Network that has created a number of working groups and task forces to focus on agricultural and environmental goals throughout the state, utilizing collective impact. Their mode of impact has been to create reports in order to present statewide assets and waste data, as well as connect stakeholders to one another as a way to enrich solution-seeking processes.

**The Solid Waste Infrastructure Advisory Committee (SWIAC).** SWIAC formed under very different pretenses than the FCC. As opposed to the organic and voluntary participation that formed the FCC, a top-down directive from the solid waste management Act 175 of 2014 required the formation of SWIAC. Following the Universal

[6] The other groups involved in the formation of the FCC were as follows: the Highfield Center for Composting; the Vermont Agency of Natural Resources, the Vermont Solid Waste District Managers Association; The Vermont Food Bank, and the Vermont Sustainable Jobs Fund.

[7] Farm to Plate Network website: http://www.vtfarmtoplate.com/network/food-cycle-coalition

Recycling law (Act 148), Section 7 of Act 175 required the forming of a stakeholder group to review the sufficiency of existing infrastructure for recyclables and organic (i.e. food and yard) residuals, as well as identify needs for new infrastructure and overall costs associated. This was to be compiled into a report for the state legislature. In addition to defining the goals of the group, Section 7 also delineated what types of waste professions were required at the table, outlined in Table 4.

**Table 4: SWIAC Member Composition, as Required by Act 175**

| **Members composition, as required by Act 175** |
|---|
| *The* Secretary of the Agency or a delegate |
| *Three* representatives of the solid waste management districts or other solid waste management entities:<br>2 solid waste management districts<br>1 independent town: |
| *One* representative of a solid waste collector that owns or operates a material recovery facility |
| *Two* representatives of solid waste commercial haulers, provided that one of the commercial haulers shall serve rural or under populated areas of the State |
| *One* representative of recyclers or food residuals or leaf & yard residuals |
| *One* VT institution or business subject to the requirements under 10 VSA 6605(j) |

*Source: "Vermont Agency" 2011*

John Kelly from the Agency of Natural Resources (ANR) is the organizer of SWIAC, and the agency identified statewide representatives from each category in the table above and asked them to participate. This 9-member committee is mostly comprised of individuals who deal with end-of-the-line waste (as opposed to the FCC that deals with food loss and waste throughout the system), thereby excluding many actors within the Vermont food system, including representatives from the production, processing, distribution, and retail professions as well as general consumers and residences. Furthermore, due to the network's composition, many of its members are also

competitors, battling for the same materials within the same wasteshed. Because of this competition, SWIAC respondents consider this group fairly contentious, however as we shall see, members were able to put their rivalries to the side, complete their report, and go beyond their requirements.

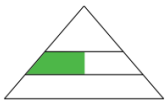
The FCC and SWIAC differ in goals, member composition and atmosphere (see Table 5), and yet, they both show the elements, primary and secondary effects of networks that I hypothesize could thoughtfully lead to food waste reduction behavior.

**Table 5: Collective Action Components of the FCC and SWIAC**

| **Network Components** | **Food Cycle Coalition (FCC)** | **Solid Waste Infrastructure Advisory Committee (SWIAC)** |
|---|---|---|
| *Year formed* | 2013 | 2014 |
| *Common agenda* | The FCC was formed organically to help Vermonters transition from "waste disposal" to "resource management" for organic residuals. This is done through helping develop programs and services for food rescue and organics diversion. | SWIAC was formed by law to review existing infrastructure, identify infrastructure needs and costs and create a report for the state legislature. |
| *Backbone support organization* | Farm to Plate Network | Agency of Natural Resources (ANR) |
| *Number of participants* | 40+ of varying participation | 11 |
| *Types of professions involved* | Composters, Solid Waste District Managers, Gleaners, Educators, Researchers, Environmental Analysts, Food Bank employees, and Farmers | Solid Waste District Managers, Composters, Commercial Haulers**,** Recyclers |
| *Facets of the food system not involved* | Processing, Retail, Consumption and Energy Production | Production and Harvest, Processing, Distribution, Retail, and Consumption |
| *Frequency of meetings* | Three times a year | Four times a year |
| *Social Connection outside of meetings* | Yearly Farm to Plate Network Picnic; Infrequent | Infrequent |

# ANALYSIS

Information exchange and inclusion of diverse perspectives are foundational elements that have enabled both primary and secondary network effects to occur. In order to illustrate these connections, the quotes in this section will have highlighted text indicating the presence of these elements, which subsequent discussions will further explore.



***Primary Effect***s
COMPREHENSIVE SHARED UNDERSTANDING

It cannot be repeated enough, food waste is a complex problem, and full comprehension of the issue requires a substantial amount of information and time. The following quotes give a window into how two different networks are approaching this complicated reality.

***FCC Participant.***

> *One of the biggest benefits of the FCC is the* ***exposure to so many different stakeholders across the state and across sectors. I would know much less about Act 148 had I not been participating in the network.*** *As a regional land use planner, I now have a better understanding of issues and complexities across the state that may find their way into my work, such as composting and the importance of soil health. It's also helped me to better talk with municipalities about some of the Ag. issues they may face.* ***Expanding that knowledge base is so great and really positive... we [network participants] are all making connections and contributing to the [network's] success****.*[8]

***SWIAC Participant.***

> *At the end of the day you have to get out and stick your head in the garbage can, don't assume that you know what the lady behind the desk is going to do with her bottle, ask her. That's what we as a committee try to bring [to the state].* ***I want to tell you what's happening on my route, I want to paint a picture of why this is so hard****, I want you to understand that the recycling weight is making our shoulders give out because we*

[8] Interview with Taylar Foster, FCC and Farmland Access and Stewardship

> *cannot load that kind of recycling quantity into these bins. It's me going to the bank and not being able to give a business plan that allows me to get the money that I need to do this, because there's no revenue [for food waste]. And [the state] needs to hear these things, you know, they set a lofty goal with no funding and now they're getting in the weeds.* ***Its information sharing; you're learning but you're also teaching others at the table, showing them what the issues are,*** *and I'm glad that's happening.*[9]

While only two examples are shown above, the most universally salient characteristic of networks was their ability to increase shared knowledge around the topic of food waste (see Figure 10). As both participants noted, individuals within the networks are both the builders and recipients of this comprehensive shared understanding. Their meetings act as leveling agents and over time create a shared language that allows everyone to take part in the conversation.

As the FCC participant illustrates, the information gathered from the network was able to further increase the participants' attentiveness to the important facets in her field of land use planning, including food waste. The elements of information exchange and inclusion (as indicated in bold) are most beneficial to the network, and through the participants' involvement and hearing from diverse perspectives, she has been able to utilize the gathered information to enrich her work. Being a recipient of diverse information has benefitted her professionally, and these benefits extend to those municipalities with whom she interacts.

The SWIAC participant also found information exchange beneficial, however his reasoning was more due to his ability to express his personal and business issues. The law left many haulers feeling slighted. Through information exchange in SWIAC, participants were able to clarify the implications that the words of the law have on the health of their workers, as well as the health of their businesses. Equally assuaging to illustrating implications is being heard. And they were heard. While the network was set up to study

[9] Interview with Trevor Mance, SWIAC

waste infrastructure, the organizer who works for the state's Agency of Natural Resources quickly found that the state had much to learn about how these mandates would actually be implemented on the ground:

> *I don't pick-up trash, or recyclables, or turn compost piles. I basically do not help with recycling or organics diversion directly, so I constantly learn from this group. I realize that we need to talk to the people on the ground more, because it you're not, then you're out of touch, and nothing you roll out will get done.*[10]

His last sentence connects to an important part of this comprehensive shared language, which is sharing the language of those who will be responsible for 'rolling out' the policies and initiatives. The voices of the implementers of food waste reduction or diversion need to be expressed in the plans. If the law had a comprehensive shared understanding of the issue of food waste, much of the potential problems of implementation would have been raised in the planning process, and if implementers were involved in that process, they could have thwarted a number of issues early on.

Both of these networks have spent time to create this shared language and understanding of the issue. This either immediately benefited participant's individual professions or aired concerns, but also, this understanding laid the basis to build off when the networks begin planning solutions. The more diverse the networks (such as the FCC), the more comprehensive the understanding of the system, and this frames the issue on a more systemic level. SWIAC is a more specialized network that has less inclusion of diverse perspectives, which does not give them the same comprehensiveness of the issue at hand. While the systemic information exchange in the FCC elucidates complementary abilities and needs of participants, the more specialized knowledge sharing in SWIAC elucidates commonalities among professions' issues, and opens up the conversation for direct improvements to be made in their section of the waste system. Because these systems are so entwined however, a specialized group's decisions may negatively affect

[10] Interview with Josh Kelly, SWIAC.

other areas in the food system (Halloran et al. 2014). The more diverse group would also likely stave off issues of implementation, and perhaps with more systemic and sustainable tactics.

Finally, the words “share” and “understanding” have multiple meanings, and multiple benefits. As indicated with the FCC participant, the sharing of information increased her understanding of the issue, whereas the SWIAC participant valued feeling understood or acknowledged, through sharing his grief. The fundamental elements of information exchange and perspective sharing have the dual ability to both enhance the knowledge around the topic of food waste, and acknowledge the needs of those individuals and professions who will be important in the implementation of food waste reduction policies.

***Primary Effects***
SOCIAL CAPITAL

Act 148 dismantled the food system, and left little to no funding for the rigorous changes it imposed. For these two reasons, social capital becomes imperative to the success of food waste implementation. When financial capital is low, social capital can help mobilize untapped resources and enable action (Potapchuk et al., 1998). Furthermore, social capital is both the glue that holds a community together, and the foundation for successful collaboration, and unlike financial, social capital actually increases with use (Putnam 1993). The following quotes highlight how networks have utilized information exchange and inclusion of diverse perspectives to build social capital.

***FCC Participant.***

> ***The key to all of this is relationships; knowing the community and the person who coordinates the food shelter at this church, and the supper at that church and the community center****. The more we can create gathering spaces to build those relationships, the more rescued food we*

> *can distribute. In central Vermont, we gathered a group of people to talk about how we can better distribute food and* ***a lot of good information*** *came out of that. One wonderful idea was this way to bring [low-income] families together and cook and eat together, and at the same time give them the skills and equipment to help them do those things when they return home. So we found a local high school that actually has a cooking program. Our vision is to open the school up one evening a month and invite families; the kids could play in the gym, the parents could cook together, using rescued, gleaned and donated foods, that they can then take home and put it in the freezer. That was the big vision, but we haven't yet gotten there…****We're a group of business leaders, coop owners, farmers, legislators. On our board are doctors, nutritionists, farmers, and people who own hardware stores, so among us we have all the resources to make this happen.*** [11]

***SWIAC Participant.***

> *I do think it is* ***good to hear from other haulers who have been your adversaries****, and, to sit down in the same room and* ***listen to their stories and realize, wait, that's the same as me****, I thought that hauler was a bad guy, but he has the same issue with his trucks…we may have confrontational meetings, but they are respectful, and at the end there is always small talk. So there's a lot of good that comes from that.*[12]

During review of previous studies, I learned that relationships are the pathways to information (Wheatley and Kellner-Rogers 1996), and yet, in my interviews it became quite clear that information is also a pathway to relationships. For this reason, a comprehensive shared understanding and social capital belong in the same level of the network pyramid. The FCC participant mentions that the relationships enable an understanding of the system, while the SWIAC participant found that information is what led to the building of relationships. Regardless of what comes first, social interactions undergird network functionality (Reagans and McEvily 2003) and play out differently in our two networks.

The FCC participant shows her work organizing an offshoot network that has come together to focus on the rescue side of food waste. This group is inclusive with a

[11] Interview with Lisa Ransom, EAT and FCC
[12] Interview with Trevor Mance, SWIAC

number of diverse participants, and shares knowledge and ideas regarding how to improve food access through the use of gleaned or rescued food. Through information exchange a new idea formed, while the inclusion of diverse perspectives is what likely gave the idea it's innovative quality, and will also likely enable the idea to come into fruition. Gathering this diverse group is expanding everyone's social network and building relationships, therefore, when information sharing and inclusion come together, social capital emerges. The resources that each individual carries are important to the whole, and as the participant mentions, "among us we have all the resources to make it happen."

In the SWIAC example, multiple types of understanding are built. Through a new comprehensive shared understanding of the main issue of waste reduction, an understanding of each other's personal business issues also resulted, and this is what led to a slow building of social capital. In this instance, the information exchange elucidated similarities among business competitors, and produced a mutual respect and a sense of group solidarity as they try and figure out how to both comply with the law and stay in business. It was the network that gave these participants the platform to learn about one another's similarities, and shift their mindsets.

Previous studies found that networks have the ability to foster social capital and establish social ties (Potapchuk et al., 1998), however there are multiple forms of social capital to consider. Localized social capital is the bonding within families and neighborhoods, whereas generalized is the bridging across social and physical boundaries (Putnam, 1993). Generalized is the more elusive of the two because it requires that stakeholders either leave their comfort zone, or in the sense of adverse situations, go "beyond tolerance" to build respect and a sense of solidarity (Potapchuk et al., 1998, 8). Both the FCC and SWIAC quotes above illustrate the building of a generalized form of social capital: in the FCC diverse stakeholders are coming together, and in SWIAC, contrary stakeholders are coming together. In this instance it appears that not only does

social capital emerge in a number of different food waste network contexts, but the complexity of the issue of food waste lends itself to building a more generalized form of social capital. Furthermore, it can be inferred that networks focusing on food waste may in fact have a greater capacity to establish extensive and dense ties. This is due to the vast range of professions and individuals who engage in either waste generation or collection that could be included in knowledge exchange. These findings can complement the research of social capital, and it would be interesting to see, as research and literature on food waste reduction grows, if the complexity of the issue of food waste could successfully bridge the "boundaries that divide communities" and build generalized social capital (Potapchuk et al., 1998, 8).

Beyond the two quotes above, many interviews illustrated that it is the complexity of the issue, as well as the pressure from the law, that have established new ties. The sentiment rang true that; "*this whole issue of food waste recovery is creating new partnerships and communication networks between multiple worlds, that before had only seen themselves in different lights*."[13]

Relationships are more like webs than hierarchies (Salamon 2002); therefore they are easier to build in horizontal networks than hierarchical governance systems. The varying compositions of networks may also affect how easily relationships or social capital are built, and then, how well social capital is utilized to achieve network goals. The more access individuals have to one another, the stronger the network will become (Jones et al. 1997). Similarly, we can theorize that the networks with more diverse members have a greater pool of information and resources, and therefore a higher potential to build generalized social capital. This leads to a more positive outlook for behavior change, and perhaps even more successful implementation of food waste reduction initiatives when the time comes.

[13] Interview with Michele Morris, CSWD

***Secondary Effects***
BEHAVIOR CHANGE

Waste is a product of deep-seeded behaviors, and I have theorized that polices that wish to reduce food waste need to be mindful of these behaviors and attempt to motivate change. The Vermont law successfully shifted the mindset from excess food being considered 'waste' to it being recognized as 'resource,' but less obvious is what is being done to help the community shift their behaviors. Through my interviews with network participants and organizers, it became clear that evidence of behavior change has surfaced in these networks. I argue that these secondary effects of behavior change resulted from both the building of a comprehensive shared understanding and social capital, and were also informed by the foundational network elements of knowledge exchange and inclusion.

***FCC Organizer***

> *Part of the beauty of this group is the **range of perspectives** so if someone has an idea they can get it vetted. Just like the conversation about the [assessment] tool- I am really counting on this group to help us figure out how to spend our time wisely, and if we have to take a few steps back to get everyone up to speed before we move forward, that's fine…**This became a place for cross-fertilization because we all have missions that connect,** and if we each grab our piece of it then **we're all doing new work and we're all connecting with each other to make that work possible**, like the solid waste and the food bank work; I think those kind of connections are the most exciting…And **before this group we didn't ever work together, we didn't know each other**. Solid waste and the food bank? Food safety? Housing and conservation? Are you kidding? But yet, **we could all identify that we had a piece to contribute, and the asset mapping project sort of affirmed that**. And then there are folks who don't come to this but they are on the mailing list, so they are looped in and they know this place is here to have a certain conversation.*[14]

[14] Interview with Pat Sagui, FCC

***SWIAC Organizer***

> *There are a lot of states in this predicament- as tonnage goes down, revenue goes down, and even just to cover the cost of all the permitting writing we do just for making sure facilities are in compliance.* ***And so an idea came out of this group,*** *to have a service fee on all solid waste activities (trash, recycling, organics collection) that would be a percentage of every bill. The idea was very innovative by the way, but really complicated and didn't gain traction. You can see it in the report. Also their idea to get a request for information from folks who need funds...It takes a lot of energy to engage stakeholders, but it* ***leads to more buy-in*** *and you can be surprised with the results.* ***Being asked by their legislature to come together to report on things from the state, it's empowering*** *…You feel like you have been given a voice in this stuff, and once we were done with requirements for the committee, it was so valuable that they asked to keep meeting, so now we have set up a Universal Recycling stakeholder group and we just had a meeting last month.*[15]

These quotes offer a number of entry points to discuss evidence of behavior change. This section will break down the three components of behavior change, as outlined by Michie et al. (2011), however I would like to note that the components are very fluid, and one often leads to the other.

***Capability*** is defined as individual's capacity (i.e. knowledge and skills) to engage in a desired activity, in our case, the activity of food waste reduction (Michie et al. 2011). According to this definition, information exchange alone would improve network participants' ability to reduce food waste. Since this exchange was present, and in many cases, very strong within networks, we can deduce that network individuals' capability has improved. Furthermore, pieces of evidence exist in each of the organizer quotes above.

The diverse FCC network has a "range of perspectives" or diverse pool of knowledge, that can enrich the work done both within and outside of the network. This passage confirms that both information exchange and inclusion are very high in the FCC, and Pat illustrates the shared language that allows everyone to take part in the

[15] Interview with Josh Kelly, SWIAC

conversation, even if that means taking extra time to "get everyone up to speed." We also see evidence of social capital, since no one knew each other beforehand, and now they are connecting in order to "make the work possible." Where this all leads is improved capability. Both the asset-mapping and assessment tools that Pat spoke of are examples of their capability at work. As referenced in Figure 11, the asset-mapping tool was the FCC's first order of business, where they identified and mapped out assets throughout the state, including expertise, constituents, networks and partners, and storage and equipment (Sagui and Claro 2015). This tool was completed in 2015 to help communities take up the task of implementing Act 148, and to do so, the FCC engaged with 28 diverse organizations statewide. Since then, four of their top ten strategies have been improved upon, including enacting a food donations model, and developing an awareness, statewide messaging and a marketing program to name a few (See Appendix E for full list.).

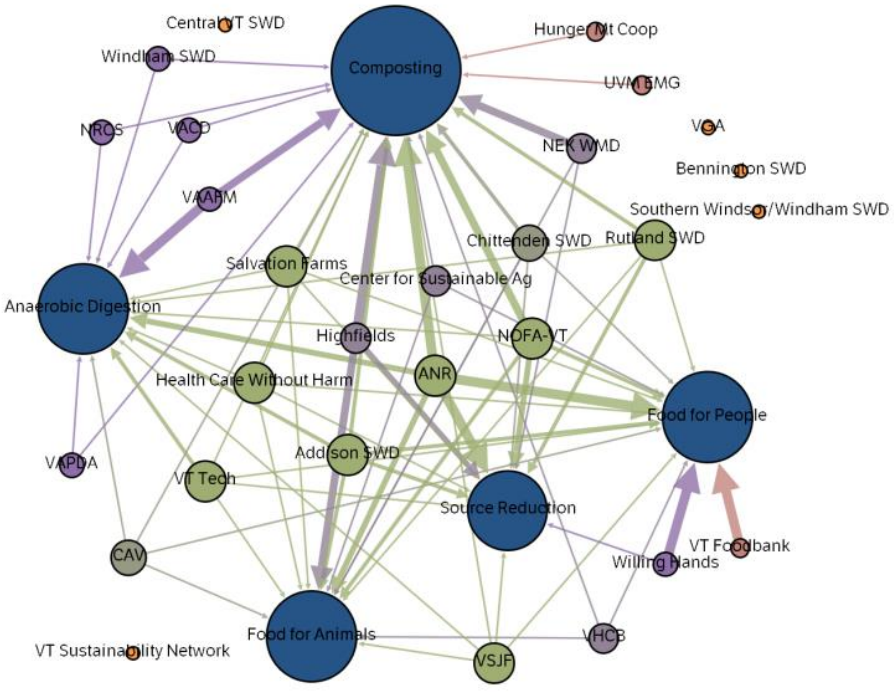



**Figure 11: Vermont Food Cycle Coalition's Constituent Asset Analysis Map from the Asset-Mapping Tool**
*Source: Sagui and Claro 2015, 9*

Beyond the asset mapping, the new assessment tool Pat mentioned is in the idea-generating stage, and I was present at the FCC meeting in January where this tool was discussed. When Pat brought the idea to the group there was an immediate brainstorming session that quickly helped solidify the best uses for this tool. One participant said, "*I have my own notebook with scratches about when and where to drop off food, but wouldn't it be great to have everyone be able to access this*," and then a solid waste manager concurred, saying that the all the solid waste districts (SWDs) have been pushing for a statewide assessment for a while to, "*figure out how much [waste] can be pulled out to see how many composting operations are actually necessary*."[16] He suggested that the assessment should breakdown the amount of food available for rescue, compost, animal feed, and so on, and doing so could foster a collaboration between a number of groups such as the Agency of Agriculture, the SWDs, the Agency of Natural Resources and Farm to Plate, since it "*benefits everyone*."[17] These tools illustrate the paths for future connections, but also respond to the shifting waste landscape. Earlier waste data reports did not take into account how much food waste could be diverted for uses other than anaerobic digestion or compost, nor did it estimate the demand for these other uses. This assessment tool would be the first in the state that looks at the waste stream with far more detail to make sure that investments in say, a large-scale composting facility, can be supported by the supply. Additionally, these tools will be available to individuals outside of the FCC, so this network is helping improve outside capability as well.

SWIAC has done something similar with their request for information; they sought to understand the funding demand for compliance throughout the state. This improved capability both within and beyond the group, because the information showed

[16] FCC meeting notes, pg. 30
[17] *ibid.*

the state the tremendous need for upgrades on existing infrastructure as well as new.[18] Furthermore, the innovative service fee idea mentioned above is an example of the "*neat little synergies*," that can happen when "*information goes back and forth*."[19] These examples are SWIACs ways of attempting to address the paradigm shift and changing landscape, and the report that Josh mentioned was the culmination of their ideas that was sent to the legislature in hopes that something would inform or invoke changes to the law.

***Opportunity*** is defined as the factors outside of individuals that enable the desired behavior of reducing food waste (Michie et al. 2011). Once comprehension is enhanced, these two networks were subsequently effective in improving participants' opportunity to engage in food waste diversion initiatives. Both the FCC and SWIAC have examples of attempting to lower exterior barriers, or, improve opportunity in the changing waste landscape. Capability building within the networks directly relates to the opportunities outside of the networks, as the FCC's Asset-mapping tool can assess. This tool again showed the potential pathways for food waste reduction, and as network participants were working on it, they found connections between each other as well. For instance, a solid waste district manager and a food bank employee are currently establishing a food scrap pick-up for all food bank locations in the manager's district, which is an idea that was sparked during their meetings within the FCC. The solid waste manager explained that, "*this was a direct result from this network because before I joined I did not even know where* [the food banks] *were, and there are about 15 or 17 scattered throughout our district*."[20]

The SWIAC service tax idea has yet to gain traction, but it still shows evidence that opportunity is being worked on in the group. Environmental barriers are harder to lower in this group because they are attempting to make changes to a law that gives little

[18] Interview with Josh Kelly and Trevor Mance, SWIAC
[19] Interview with Trevor Mance, SWIAC
[20] Interview with Paul Tomasi, FCC and SWDMA

wiggle room; the horizontal network efforts are bumping up against the hierarchy. Still, the ideas coming out of this group are innovative, which could also be due in part to the constraints of the law itself.

As with a comprehensive shared understanding of the issue, in order for opportunity to be lowered, implementers should be at the table. In the case of SWIAC, the implementers (i.e. haulers, composters and recyclers) were not involved before the passing of the law, which created issues that the legislature and other networks are still trying to work out. It appears that not including these voices in the planning of the law may have had adverse effects on opportunity; raising instead of lowering environmental barriers. An example of the raised environmental barriers on the residential side is a practice that one solid waste district manager refers to as "*reluctant recycling,"* or throwing the wrong things in recycling and organic waste bins, which contaminates the entire lot so it must all be landfilled. [21]

It is for this reason that involving implementers on a wide scale from the beginning will elucidate issues with implementation early on, and ideally, solve them before implementation begins. A respondent illustrated this in terms of another project involving a school lunch line. She explained that in a process of planning sort stations in schools, both the custodial staff as well as kindergarteners needed to be involved since, "*adults don't see the world from 3 feet high*."[22] While custodial staff and kindergarteners are rarely found together at a conference table, their input in the activities that will directly change *their* behavior, such as diverting food waste, is of upmost value. "*It's the users*" she said, "*that have to have input, and then they'll feel ownership.*"[23] This last statement leads us into how inclusivity and information sharing can not only lower environmental barriers, but also lead to motivation.

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[21] Interview with Paul Tomasi, FCC and SWDMA.

[22] Interview with Michele Morris, CSWD

[23] *ibid.*

***Motivation*** is defined as the brain processes and emotions that energize and direct behavior (Michie et al. 2011). This component is more elusive, harder to enact, and often takes longer to build than capability and opportunity. How can a network make individuals care more about the topic of food waste? *"It's hard,"* according to a network organizer, "*if I have to drive five miles to get rid of my banana peels, I'm going to need a lot of motivation, or, an incentive.*"[24] In the case of our networks, not one offered financial incentives for participation, and they all required time and additional effort be taken from their already busy schedules. Additionally, the networks are still preparing the plans they hope to implement, making it difficult to see evidence of motivation around food waste reduction. At this stage, what this study can show is the motivation to show up at network meetings and contribute.

In the FCC quote above, Pat mentions that everyone in the group was able to identify that they had a part to play in restructuring the new system, and that everyone is contributing. Furthermore, the solid waste district manager in the FCC said that, "*it's incredible to be a part of a group that really cares. There is no drop off in membership, they aren't twiddling their thumbs- they're focused and motivated*." [25] Probing further he also mentioned that he was originally on the fence about this network, but within the first meeting it became clear that he found value in this group and their work. The FCC is clearly motivating the participants to show up as well as participate. What are the factors that might be contributing to this motivation? We can actually look to the SWIAC group for an answer.

In the SWIAC quote above (page 46), Josh mentions a few things that have led to motivation in this somewhat discordant group. Despite the contentious environment, that alone offered little motivation, Josh said it was empowering for the participants to be asked by their legislature to participate. This invitation demonstrated that they were

[24] Interview with Michael Batcher, Bennington County Solid Waste Alliance
[25] Interview with Paul Tomasi, FCC and SWDMA

appreciated and that the state agency believed they could add value to the law. This was, as Josh suggested, what ultimately motivated network participants to engage. SWIAC participants were so engaged in fact, many drove three hours to come to the meetings, and once their task to write an infrastructure report was complete, they decided to *keep meeting* to continue the discussions about the law.[26] While this group had a particularly unique environment, many network organizers explained their continual surprise that participants kept coming back with little to no tangible incentive. Not one network offered financial incentives, and they all required time and additional effort be taken from their already busy schedules. What can be inferred here is that somehow, and in some instances, being included motivated participants, and networks were the platform that offered them that entry.

Both of our networks speak to a deeper discussion of motivation and behavior change that leads back to the network pyramid. While information exchange can certainly unearth the heart of the issue and make network participants care more about reducing food waste, it is inclusion that brings people to the table in the first place. Whether the perspectives at the table are diverse or not, feeling included in the discussion is a large factor to changing behavior. However, inclusion of diverse perspectives will be important for statewide food waste reduction, because this law will affect everyone by 2020, and they should have the option to be included in the discussion.

This is a classic cautionary tale that many planners face when implementing changes to the built environment. Participatory and equity planning professionals and researchers understand that no change imposed on a communities' environment will be well received unless the community is involved in the change. While usually used for many youth and disability activist groups, the slogan, "Nothing about us, without us, is for us" has an appropriate sentiment that can be applied to wherever inclusion is

[26] Interview with Josh Kelly, SWIAC

important. It asserts that policy decisions should include comprehensive participation of all those who will be affected by the policy changes (Wagner 1991). There is much work to be done in this area, and the issue of food waste is no exception. If a law, program, or policy is to be effective in changing the way that people function on a daily basis, then these changes need to be informed by those who will be affected.

# DISCUSSION AND CONCLUSION

Vermont's Universal Recycling law attempted to change food waste behavior by imposing bans. This tactic has shown progress in some areas (i.e. food donations, awareness, and commercial waste reductions), but it is still hindered by difficulties with parallel collection, and opposition from the hauling community for lack of funding and presumed disregard for their professions' hardships. These issues will likely continue once collection spreads to all businesses and residences. Act 148 was formed by a hierarchical governance structure; however, I theorize that if it were enacted with a combination of governance structures, it would have likely not hit as many road bumps.

As evidenced in this study, the Vermont networks with their horizontal governance structures have a lot to offer the realm of food waste reduction. The network pyramid illustrates both the elements and effects of networks that I believe will be effective in the planning and enacting of future food waste reduction policies and initiatives.

Information exchange and the inclusion of diverse perspectives are the elements that I believe will be strikingly important as more and more municipalities adopt food waste reduction initiatives. Through the lens of networks, we have been able to see why this is the case, and it is for two reasons. First, information exchange and inclusion of diverse perspectives in a group or community help to build a comprehensive shared understanding of the issue of food waste, as well as social capital. These primary effects allow new solutions or innovative ideas to emerge, and also unearth the untapped resources of the community in order to move forward with new ideas. Secondly, these primary effects lead to secondary effects in the form of improved behavior change. Increased capability, the lowering of environmental barriers, and increased motivation will be important for changing deep-seeded waste behaviors (Comber and Thieme 2013; Secondi et al. 2013; Quested et al. 2013).

***Strategies for Alternative Food Waste Reduction Policies***

Given the results above, I would like to make two recommendations for the growing number of municipalities that are moving towards food waste reduction. First, I recommend, as studies have before me, that coordination should exist between various governance structures, and in this case, between hierarchical and horizontal. Both forms of governance have a lot to offer the realm of food waste reduction, a notion that is important for the hierarchy to recognize. The state legislature had the power to enact a law that created a waste paradigm shift, and applied pressure to disparate stakeholders to come together and form these horizontal networks. In that sense, the law was wildly successful. Where the law ran into trouble with implementation and understanding the realities hindering waste behavior change is precisely where networks could enter. Had the law been drafted as a more iterative process as opposed to directive, they could have still applied the pressure on stakeholders to come together, but kept the process open enough to be more inclusive and recognize and correct for problems with implementation early in the lawmaking process. This would connect the law to the realities on the ground.

Within these Vermont networks, the effects of a comprehensive understanding of the issue, the building of social capital, lowering barriers and increasing individuals' capability and motivations for reducing food waste, all stemmed from the elements of information exchange and the inclusion of diverse perspectives. I recommend that the hierarchy should include these elements in food waste reduction policy planning, and coordinating with horizontal governance structures can help them get there. Information gathering meetings should include diverse stakeholders, including implementers. If so, I theorize that the emphasis on knowledge exchange and inclusion will eventually garner support and create buy-in from constituents, even to the point where effective champions could emerge to help move the needle forward.

The task of including information exchange and the inclusion of diverse perspectives in food waste reduction policy planning does take time, effort and funding, but if the initiative is important enough to enact into state law, then the state should secure funds for this purpose. Recall Hanleybrown et al. (2012) who found that preconditions for successful collective impact or collaboration include urgency for change as well as adequate financial resources. The law successfully created urgency for change, which was the pressure that forced many disparate stakeholders to coalesce, however it gave no financial resources for the cause. This makes both social capital more important, and stakeholder collaboration more difficult. Equity planning expert Dr. Barbara Brown Wilson posits that, "values are reflected in the budget,"[27] therefore, if the initiative is of value to the state, then it should be reflected as such in the budget.

Multi-level governance could also help elucidate what should be included in the budget. As previously mentioned in Table 3 (page 31), Act 148's reconceptualization of waste has dismantled the current food and waste systems, and has therefore produced benefits for some, while imposing costs on others. In order to ameliorate for the costs imposed on certain communities such as the haulers, the Vermont state legislature should include incentives in the state budget, or implement policies or economic development tools to correct for the inequities that this law imposes.

In addition to gaining a comprehensive understanding of the issues, and winners and losers impacted by Act 148, multi-level governance can elucidate power differentials. The research in this thesis focuses specifically on network elements and effects for network participants, and acts as a window on horizontal governance contributions to food waste reduction policy. When analyzing forms of governance, it is important to note that power differentials exist between individuals within governance structures. Horizontal or multi-level governance systems empower participants, whereas hierarchical

[27] Cornell Planning Colloquium presentation, April 08, 2016.

governance systems tend to impose laws that power over community members. In relation to food waste reduction policies, simple power-over mechanisms can lead to noncompliant responses from community members, such as 'reluctant recycling,' or the contamination that ruins recycling machinery.[28] In this way, Vermont residents have some power to impair progress. Therefore, multi-level governance structures that invite participation, allow communication to flow to and from the legislature and the public, and may lead to more effective implementation and less insurgent responses.

Recall Thomas Kuhn's (2012) structure of science revolutions; in the context of shifting waste paradigms, the "reformulations" he spoke of are the improvements that could be made on the Vermont Universal Recycling Law, informed by the work of networks or other horizontal governance structures. Through their collaboration with a diverse group of stakeholders, they were able to exchange knowledge and realize where holes exist in the law, and together create innovative solutions while strengthening the social resources that could help implement these solutions. If the law were a scientific discovery, then networks would be the scientists who revise, rework and redevelop the theory to make it stronger.

Secondly, the desired sequence of events in my first recommendation mirrors that of participatory planning, therefore I highly recommend that planners see their potential in this line of work, and that municipalities include them in these plans. Historically speaking, the first planners emerged to create a citywide sanitation system (Peterson 1979). Their tasks were to improve the health and general welfare of their community. In this vein, I see no difference between the goals of then and now, except for additional benefits of successful food waste reduction such as community sustainability and resiliency.

[28] Interview with Paul Tomasi, FCC and SWDMA

Additionally, the area between the legislature and the public is one where planners are well versed, and participatory and equity planners especially can be very useful in gathering community input to inform food waste policies. This is a classic coordination issue, even if the subject matter is waste instead of neighborhood revitalization, park design, or land use. Waste reduction policies are changing people's habits and how they function within their space, therefore, these issues require planners to assess the needs of the community, and help translate them into plans or policy design. Participatory planners know that even if the design is well done, the absence of inclusion creates mistrust, and the work is likely to be misunderstood and not effective. As is likely the case in many cities and municipalities, a history of mistrust exists in communities who feel slighted by government policies. This mistrust causes paralysis instead of behavior change. Planners have a tremendous opportunity to be involved in this kind of work, and the complexity of the issue of food waste could lead to an expansive strengthened social network that could then be used for future issues.

## ***Conclusion***

The landscape underfoot is swiftly changing the way we as a society value food and perceive food waste. Unused food is increasingly considered a rich resource proven to mitigate the issues of climate change (Venkat 2012), soil degradation and water loss (Bloom 2011), and acute, immediate hunger (Stuart 2009). This realization happened quite rapidly in Vermont through a waste paradigm shift enacted by the Universal Recycling Law. This shift sparked the emergence of networks, and these horizontal governance structures sought community and stakeholder input to connect the requirements in the law to the reality of the Vermont food and waste systems. How? Do any elements exist in these networks that could lead to improved waste behaviors?

The above question drove this research, and I found that not only did elements exist, but also they could lead to positive effects on changing waste behaviors. The elements present were information exchange and the inclusion of diverse perspectives, both of which are not unique to networks, but are more likely in horizontal governance structures (Provan and Kenis 2008). Inclusion and information exchange led to primary effects of a comprehensive shared understanding of the issues of food waste, as well as the building of social capital, and finally, these two effects, along with the two network elements, showed evidence of secondary effects of behavior change. Due to these findings, I recommend that hierarchical governance structures should include information exchange and inclusion of diverse perspectives in food waste reduction policy planning, and that coordinating with horizontal governance structures such as networks, can help them get there. Additionally, since inclusion of diverse perspectives is a foundational component for food waste reduction, I also argue that participatory planners have a hand in facilitating the coordination between the hierarchy and the public.

### ***Future Research***

Beyond the findings provided in this report, the notion that food waste reduction could be a driver for restructuring community can also be inferred from this research. Thoughtful waste reduction engages diverse food and waste system stakeholders, many of whom have never connected before, and this has shown to build community among participants, and could strengthen statewide networks. Much of the focus of this research narrowed on network effects for the participants themselves, and theorized how that might translate to the general community, therefore further studies could go into the communities where networks reside to test their effectiveness on the community system as a whole. In Vermont this type of study would likely have to wait until the final phases of the Universal Recycling Law, since many networks are still in the planning phases.

Of similar focus, but under the vein of furthering social capital research, it would be interesting to see, as research and literature on food waste reduction grows, if the complexity of the issue of food waste is one that could bridge difficult divides among communities. Additionally, what sort of policy would need to be in place to best bridge those divides?

While our networks considered more perspectives than the hierarchy, neither the FCC nor SWIAC included all professions' perspectives along the food system. The invited space of SWIAC merely engaged perspectives who dealt with waste removal or resource recovery, and the invented space of the FCC invited all who were interested in participating, but even then, professions or consumers may have chosen to not partake. Furthermore, a limited number of interviews were conducted for this study and therefore not all network participant perspectives were incorporated. Figure 12 below illustrates the food system professions accounted for in participating networks, as well as those not accounted for in either network, or this study.

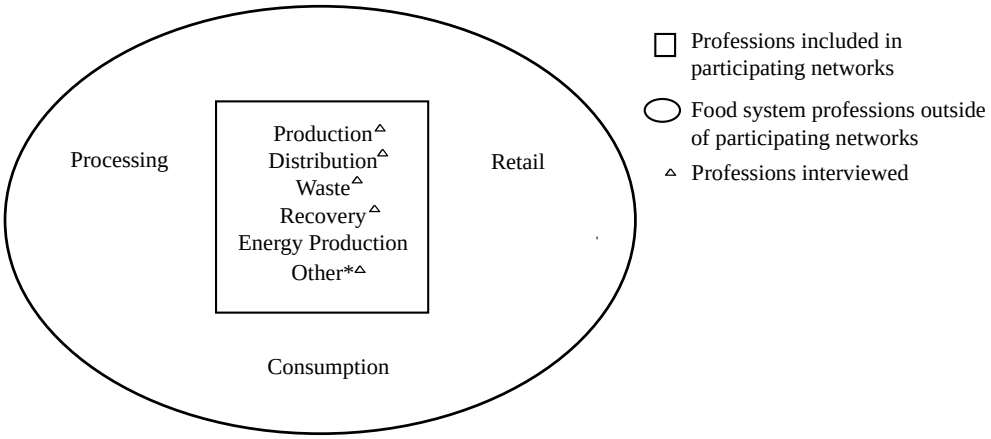



**Figure 12: Food System Professions Inside and Outside of Participating Networks**
* Other includes educational, administrative and municipal professions that do not directly relate to the food system.

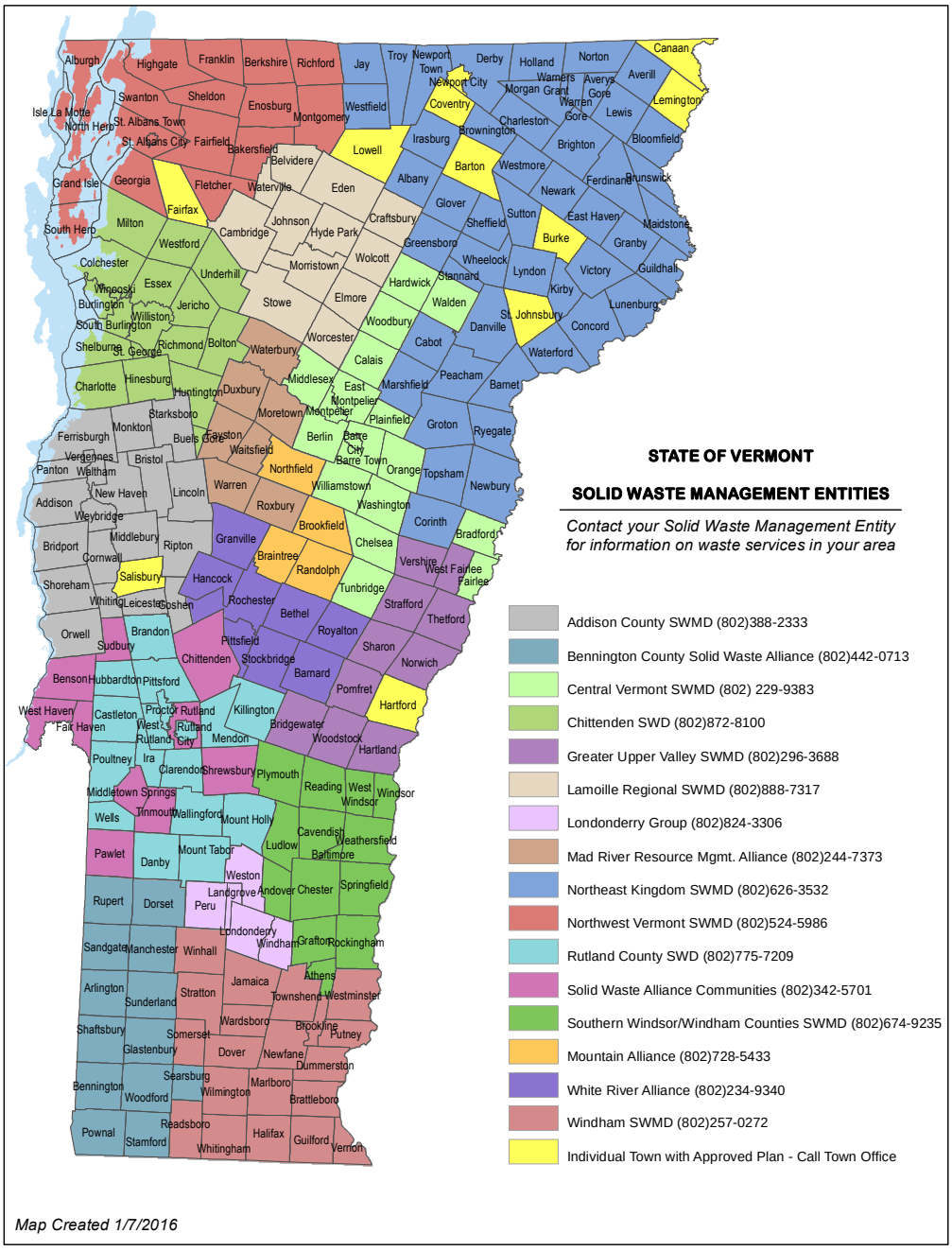
The framework created for this study analyzed the elements *inside* networks and how they affect participants; however, this work unearths more questions pertaining to network effects. Unless horizontal networks can include all perspectives within a

community, will they run across the same implementation issues as the hierarchy? Future research could test the framework created in this study to see how network elements and effects might affect those *outside* of the network, whose perspectives were not at the table. How could networks reach those outside the network? Bridging ties, building social capital and lowering environmental and educational barriers could theoretically aid in inclusion, as well as law and the change of systems. Future research could analyze these aspects of horizontal governance structures to paint a larger, more comprehensive picture of network effects on a food system community.

When I originally set up this study, I was hoping to ask the question of 'how effective' are these networks, however through interviews it was apparent that the 'how' could not be answered without first asking 'what are the effects' of networks. My assumption was that horizontal governance structures, such as those in networks, are more effective in implementing food waste reduction tactics than hierarchical structures for reasons such as inclusivity in the planning process. What I learned is two-fold; the hierarchy is important for applying appropriate pressure on diverse stakeholders who may not otherwise see their missions overlapping, and horizontal governance structures have elements that are important for communities who wish to solve any host of complex issues, including food waste. Future research on 'how effective' networks are can build off of the findings in this thesis and explore the possibility for multi-level governance to restructure community and create a more resourceful and just waste landscape.

APPENDIX A

## Vermont Solid Waste Management Entities (SWMEs)




*Source: http://www.anr.state.vt.us/dec/wastediv/solid/pubs/solid_dist.pdf*

APPENDIX B

**Table 6: Interview Questions**

| Category | Question |
|---|---|
| **General Network** | 1. What food waste networks are you a part of or connected to?<br>a. What is your role within the(se) network(s)?<br>2. How did the network form?<br>a. Was it in existence prior to Act 148? |
| **Collective Impact** | 3. Does the network have a shared goal or common agenda?<br>a. Has this goal changed since the network formed?<br>b. Has it changed since Act 148 passed?<br>i. If so, in what ways?<br>4. How is the network supported and managed?<br>a. Is there one organization that oversees the network activities?<br>b. How does the network function financially?<br>5. How does communication happen within the network?<br>a. Do participants communicate in a professional manner, social, or both?<br>b. How often does communication happen? |
| **Behavior Change** | 6. Has your participation in the network(s) changed the way you operate your organization?<br>a. If so, in what way?<br>b. Has it changed due to the passing of Act 148? If so, in what way?<br>7. Have network efforts improved knowledge of food waste? In what way?<br>8. Have network efforts broken down any environmental barriers? How so?<br>9. Have network efforts increased individual actor motivation? How so?<br>10. In reference to questions 7-9, what do you think happened in the network in order to have these effects? |
| **Network Effects** | 11. In what ways do you think the network has been effective?<br>a. How do you know? Does the network have specific target goals, or measureable indicators?<br>12. Have there been any unexpected positive or negative outcomes as a result of working with the network? |

| | |
|---|---|
| **Barriers and Conflicts** | 13. Have there been any conflicts that the network addressed, or has the network able to overcome any conflicts? Has there been any collaboration between differences?<br>14. Has the network, or your work with the network, come across any barriers or pitfalls?<br>a. Were you able to overcome them? If so how? If not, what have you tried? |
| **Additional Resources** | 15. Is there anything else that you think I am missing, or is there someone else to whom you think I should talk? |

**Consent email**

Dear: _____

Good [morning/afternoon], my name is Jaclyn Hochreiter and I am a graduate student in City and Regional Planning at Cornell University, where I am focusing on food system planning. I am contacting you to ask for your help. I am studying the effectiveness of network governance structures on implementation of food waste reduction tactics. Given your work with [blank], I would very much like to talk with you. If you are willing, I would like to set up a time to ask you a few questions either over the phone, or in person in January. It should not take more than 45 minutes of your time.

The information you provide may be included in presentations at conferences or in journal articles. I would like to ask your permission to record the interview and quote you directly. The recordings are purely for the purpose of transcription.

1. May I record the interview with you? (yes or no)
2. May I quote you directly? (yes or no)
3. If yes to the two above, would you like to keep certain things off the record? (yes or no)

Additionally, are there other individuals with whom you think I should connect?

Please note your participation is entirely voluntary. Feel free to ask any questions you have now, and if you have questions later, you may contact me, Jaclyn Hochreiter at jrh375@cornell.edu or at 607-368-3460.

If you have any questions or concerns regarding your rights as a subject in this study, you may contact the Institutional Review Board (IRB) for Human Participants at 607-255-

6182 or access their website at http://www.irb.cornell.edu. You may also report your concerns or complaints anonymously through Ethicspoint online at www.hotline.cornell.edu or by calling toll free at 1-866-293-3077. Ethicspoint is an independent organization that serves as a liaison between the University and the person bringing the complaint so that anonymity can be ensured.
Thank you very much for your time.

APPENDIX C

**Calculations of Vermont Population Density (2014) without cities and Population Density Map.**

| City | Population | Area |
|---|---|---|
| Burlington | 42211 | 15.1 |
| Essex | 20724 | 39.6 |
| South Burlington | 18743 | 29.6 |
| Colchester | 17384 | 58.6 |
| Rutland City | 15942 | 7.6 |
| Bennington | 15431 | 42.5 |
| Brattleboro | 12005 | 32.4 |
| Milton | 10667 | 60.9 |
| Hartford | 10367 | 45.9 |
| Essex Junction | 9881 | 4.7 |
| Springfield | 9232 | 49.5 |
| Williston | 9215 | 30.7 |
| Barre City | 9052 | 4 |
| Middlebury | 8545 | 39.2 |
| Barre Town | 7857 | 30.7 |
| Montpelier | 7855 | 10.3 |
| Shelburne | 7736 | 44.9 |
| St. Johnsbury | 7571 | 36.8 |
| Winooski | 7267 | 1.5 |
| St. Albans | 6918 | 2 |

| | | | |
|---|---|---|---|
| **Total Population** | 626042 | **Area of State** | 9620 |
| **Population in cities** | 254603 | **Area in Cities** | 586.5 |
| **Population not in cities** | 371439 | **Area not in Cities** | 9033.5 |
| ***Population Density per square mile (not including cities*** | 41.1 | **% of area in cities** | 6.1 |
| | | ***% of area not in cities*** | 93.9 |

*Source: US Census Bureau. American Fact Finder. Population, Area and Density in selected cities for 2010*
*http://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml?src=CF*

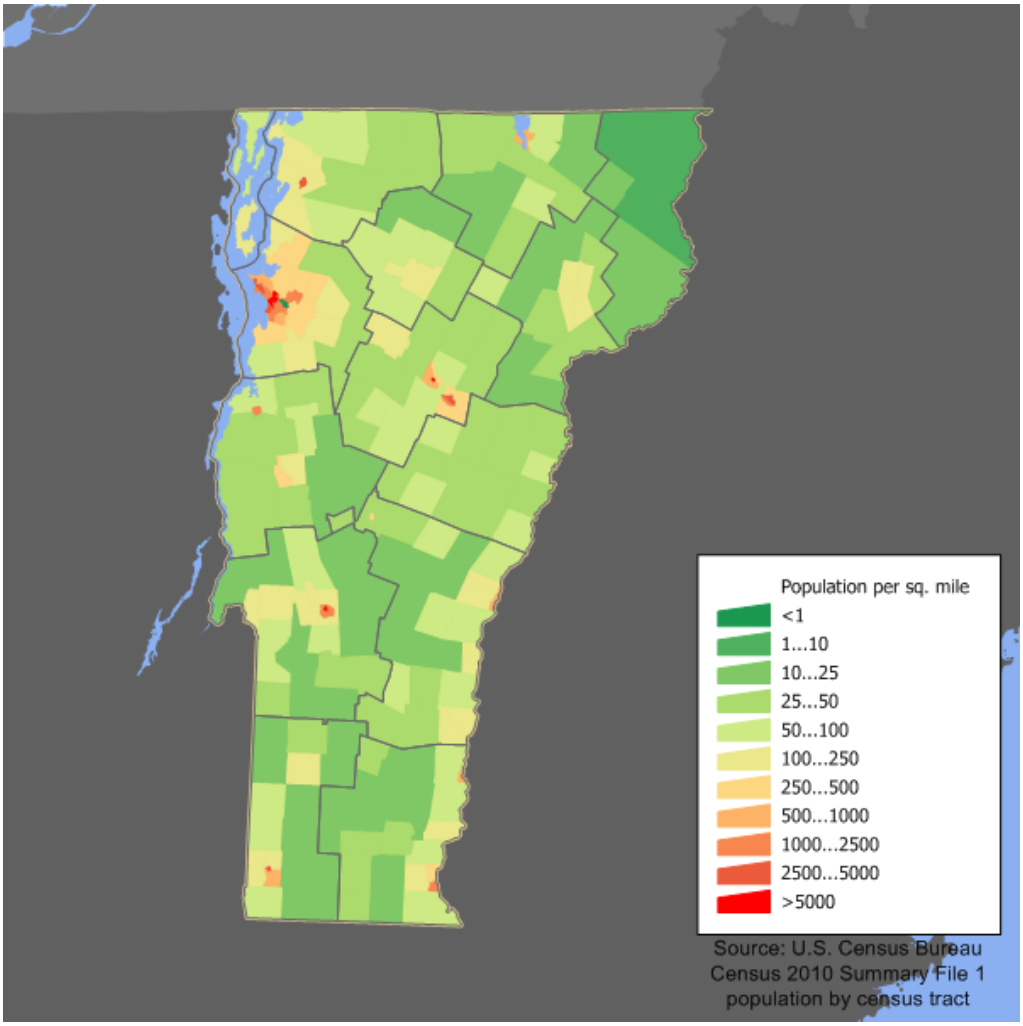



*Figure 13: Population Density Map of Vermont*

APPENDIX D

**Act 148: The Universal Recycling Law**
**No. 148. An act relating to establishing universal recycling of solid waste.**

(H.485)

It is hereby enacted by the General Assembly of the State of Vermont:

* * * Universal Recycling of Solid Waste * * *

Sec. 1. 10 V.S.A. § 6602 is amended to read:

§ 6602. DEFINITIONS

For the purposes of this chapter:

(1) "Secretary" means the secretary of the agency of natural resources, or his or her duly authorized representative.

(2) "Solid waste" means any discarded garbage, refuse, septage, sludge from a waste treatment plant, water supply plant, or pollution control facility and other discarded material, including solid, liquid, semi-solid, or contained gaseous materials resulting from industrial, commercial, mining, or agricultural operations and from community activities but does not include animal manure and absorbent bedding used for soil enrichment; high carbon bulking agents used in composting; or solid or dissolved materials in industrial discharges which are point sources subject to permits under the Water Pollution Control Act, chapter 47 of this title.

* * *

(12) "Disposal" means the discharge, deposit, injection, dumping, spilling, leaking, or placing of any solid waste or hazardous waste into or on any land or water so that such solid waste or hazardous waste or any constituent thereof may enter the environment or be emitted into the air or discharged into any ground or surface waters.

(13) "Waste" means a material that is discarded or is being accumulated, stored, or physically, chemically, or biologically treated prior to being discarded or has served its original intended use and is normally discarded or is a manufacturing or mining by-product and is normally discarded.

* * *

(19) "Implementation plan" means that plan which is adopted to be consistent with the state solid waste management plan. This plan must include all the elements required for consistency with the state plan and an applicable regional plan and shall be approved by the secretary. This implementation plan is the basis for state certification of facilities under subsection 6605(c) of this title.

* * *

(27) "Closed-loop recycling" means a system in which a product made from one type of material is reclaimed and reused in the production process or the manufacturing of a new or separate product.

(28) "Commercial hauler" means any person that transports:

(A) regulated quantities of hazardous waste; or

(B) solid waste for compensation in a motor vehicle having a rated capacity of more than one ton.

(29) "Mandated recyclable" means the following source separated materials: aluminum and steel cans; aluminum foil and aluminum pie plates; glass bottles and jars from foods and beverages; polyethylene terephthalate (PET) plastic bottles or jugs; high density polyethylene (HDPE) plastic bottles and jugs; corrugated cardboard; white and colored paper; newspaper; magazines; catalogues; paper mail and envelopes; boxboard; and paper bags.

(30) "Leaf and yard residual" means source separated, compostable untreated vegetative matter, including grass clippings, leaves, kraft paper bags, and brush, which is free from noncompostable materials. It does not include such materials as pre- and postconsumer food residuals, food processing residuals, or soiled paper.

(31) "Food residual" means source separated and uncontaminated material that is derived from processing or discarding of food and that is recyclable, in a manner consistent with section 6605k of this title. Food residual may include preconsumer and postconsumer food scraps. "Food residual" does not mean meat and meat-related products when the food residuals are composted by a resident on site.

(32) "Source separated" or "source separation" means the separation of compostable and recyclable materials from noncompostable, nonrecyclable materials at the point of generation.

(33) "Wood waste" means trees, untreated wood, and other natural woody debris, including tree stumps, brush and limbs, root mats, and logs.

Sec. 2. 10 V.S.A. § 6604 is amended to read:

§ 6604. SOLID WASTE MANAGEMENT-PLAN

(a) No later than -November 1, 2013, the secretary shall adopt, after notice and public hearing pursuant to 3 V.S.A. chapter 25, a solid waste management plan which sets forth a comprehensive statewide strategy for the management of waste.

(1)The plan shall promote the following priorities, as found appropriate for certain waste streams, based on data obtained by the secretary as part of the analysis and assessment required under subdivision (2) of this subsection:

(A) the greatest feasible reduction in the amount of waste generated;

(B) materials management, which furthers the development of products that will generate less waste;

(C) the reuse and closed-loop recycling of waste to reduce to the greatest extent feasible the volume remaining for processing and disposal;

(D) the reduction of the state's reliance on waste disposal to the greatest extent feasible;

(E) the creation of an integrated waste management system that promotes energy conservation, reduces greenhouse gases, and limits adverse environmental impacts;

(F) waste processing to reduce the volume or toxicity of the waste stream necessary for disposal~~;~~

(2) The plan shall be revised at least once every five years and shall include:

(A) an analysis of the volume and nature of wastes generated in the state, the source of the waste, and the current fate or disposition of the waste. Such an analysis shall include a waste composition study conducted in accordance with generally accepted practices for such a study;

(B) an assessment of the feasibility and cost of diverting each waste category from disposal, including, to the extent the information is available to the agency, the cost to stakeholders, such as municipalities, manufacturers, and customers. As used in this subdivision (a)(2), "waste category" means:

(i) marketable recyclables;

(ii) leaf and yard residuals;

(iii) food residuals;

(iv) construction and demolition residuals;

(v) household hazardous waste; and

(vi) additional categories or subcategories of waste that the secretary identifies that may be diverted to meet the priorities set forth under subdivision (a)(1) of this section;

(C) a survey of existing and potential markets for each waste category that can be diverted from disposal;

(D) measurable goals and targets for waste diversion for each waste category;

(E) methods to reduce and remove material from the waste stream, including commercially generated and other organic wastes, used clothing, and construction and demolition debris, and to separate, collect, and recycle, treat or dispose of specific waste materials that create environmental, health, safety, or management problems, including, tires, batteries, obsolete electronic equipment, and unregulated hazardous wastes. These portions of the plans shall include strategies to assure recycling in the state, and to prevent the incineration or other disposal of marketable recyclables~~.~~

(F) a coordinated education and outreach component that advances the objectives of the plan, including the source separation requirements, generator requirements to remove food residuals, and the landfill disposal bans contained within this chapter;

(G) performance and accountability measures to ensure that implementation plans are effective in meeting the requirements of this section;

~~(~~(H) An assessment of facilities and programs necessary at the state, regional or local level to achieve the priorities identified in subdivision (a)(1) of this section and the goals established in the plan. These portions of the plan shall be based, in part, on an assessment of the status, capacity, and life expectancy of existing solid waste facilities, and they shall

include siting criteria for waste management facilities, and shall establish requirements for full public involvement.

(b) The secretary shall hold public hearings, conduct analyses, and make recommendations to the house and senate committees on natural resources and energy regarding the volume, amount, and toxicity of the waste stream. In this process, the secretary shall consult with manufacturers of commercial products and of packaging used with commercial products, retail sales enterprises, health and environmental advocates, waste management specialists, the general public, and state agencies. The goal of the process is to ensure that packaging used and products sold in the state are not an undue burden to the state's ability to manage its waste. The secretary shall seek voluntary changes on the part of the industrial and commercial sector in both their practices and the products they sell, so as to serve the purposes of this section. In this process, the secretary may obtain voluntary compliance schedules from the appropriate industry or commercial enterprise, and shall entertain recommendations for alternative approaches. The secretary shall report at the beginning of each biennium to the house and senate committees on natural resources and energy, with any recommendations or options for legislative consideration.
At least 45 days prior to submitting its report, the secretary shall post any recommendations within the report to its website for notice and comment.

~~(1)~~ In carrying out the provisions of this subsection, the secretary first shall consider ways to keep hazardous material; toxic substances, as that term is defined in subdivision 6624(7) of this title; and nonrecyclable, nonbiodegradable material out of the waste stream, as soon as possible. In this process, immediate consideration shall be given to the following:

~~(A)~~ evaluation of products and packaging that contain large concentrations of chlorides, such as packaging made with polyvinyl chloride;

~~(B)~~ evaluation of polystyrene packaging, particularly that used to package fast food on the premises where the food is sold;

~~(C)~~ evaluation of products and packaging that bring heavy metals into the waste stream, such as disposable batteries, paint and paint products and containers, and newspaper supplements and similar paper products;

~~(D)~~ identification of unnecessary packaging, which is nonrecyclable and nonbiodegradable.

With respect to the above, the secretary shall consider the following:

~~(E)~~ product and packaging bans, products or packaging which ought to be exempt from such bans, the existence of less burdensome alternatives, and alternative ways that a ban may be imposed;

~~(F)~~ tax incentives, including the following options:

(i) product taxes, based on a sliding scale, according to the degree of undue harm caused by the product, the existence of less harmful alternatives, and other relevant factors;

(ii) taxes on all nonrecyclable, nonbiodegradable products or packaging;

~~(G)~~ deposit and return legislation for certain products.

(c) A portion of the state's solid waste management plan shall set forth a comprehensive statewide program for the collection, treatment, beneficial use, and disposal of septage and sludge. The secretary shall work cooperatively with the department of health and the agency of agriculture, food and markets in developing this portion of the plan and the rules to carry it out, both of which shall be consistent with or more stringent than that prescribed by section 405 of the Clean Water Act (33 U.S.C. § 1251, et seq.). In addition, the secretary shall consult with local governmental units and the interested public in the development of the plans. The sludge management plan and the septage management plan shall be developed and adopted by January 15, 1987. In the development of these portions of the plan, consideration shall be given to, but shall not be limited to, the following:

(1) the varying characteristics of septage and sludge;

(2) its value as a soil amendment;

(3) the need for licensing or other regulation of septage and sludge handlers;

(4) the need for seasonal storage capability;

(5) the most appropriate burdens to be borne by individuals, municipalities, and industrial and commercial enterprises;

(6) disposal site permitting procedures;

(7) appropriate monitoring and reporting requirements;

(8) actions which can be taken through existing state programs to facilitate beneficial use of septage and sludge;

(9) the need for regional septage facilities;

(10) an appropriate public information program; and

(11) the need for and proposed nature and cost of appropriate pilot projects.

(d) Although the plan adopted under this section and any amendments to the plan shall be adopted by means of a public process that is similar to the process involved in the adoption of administrative rules, the plan, as initially adopted or as amended, shall not be a rule.

Sec. 3. 10 V.S.A. § 6603 is amended to read:

§ 6603. SECRETARY; POWERS

In addition to any other powers conferred on him or her by law, the secretary shall have the power to:

(1) Adopt, amend, and repeal rules pursuant to 3 V.S.A. chapter 25 implementing the provisions of this chapter;

(2) Issue compliance orders as may be necessary to effectuate the purposes of this chapter and enforce the same by all appropriate administrative and judicial proceedings;

(3) Encourage local units of government to manage solid waste problems within their respective jurisdictions, or by contract on a cooperative regional or interstate basis;

(4) Provide technical assistance to municipalities;

(5) Contract in the name of the state for the service of independent contractors under bond, or with an agency or department of the state, or a municipality, to perform services or to provide facilities necessary for the implementation of the state plan, including but not limited to the transportation and disposition of solid waste;

(6) Accept, receive and administer grants or other funds or gifts from public and private agencies, including the federal government, for the purpose of carrying out any of the functions of this chapter. This would include the ability to convey such grants or other funds to municipalities, or other instruments of state or local government.

(7) Prepare a report which proposes methods and programs for the collection and disposal of household quantities of hazardous waste. The report shall compare the advantages and disadvantages of alternate programs and their costs. The secretary shall undertake a voluntary pilot project to determine the feasibility and effectiveness of such a program when in the secretary's opinion such can be undertaken without undue risk to the public health and welfare. Such pilot program may address one or more forms of hazardous waste.

(8) Provide financial assistance to municipalities.

(9) Manage the hazardous wastes generated, transported, treated, stored, or disposed in the state by administering a regulatory and management program which, at a minimum, meets the requirements of subtitle C of the Resource Conservation and Recovery Act of 1976, and amendments thereto, codified as 42 U.S.C. Chapter 82, subchapter 3, and the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended.

(10) Require a facility permitted under section 6605 of this title or a transporter permitted under section 6607 of this title to explain its rate structure for different categories of waste to ensure that the rate structure is transparent to residential consumers.

Sec. 4. 10 V.S.A. § 6605 is amended to read:

§ 6605. SOLID WASTE MANAGEMENT FACILITY CERTIFICATION

(a)(1) No person shall construct, substantially alter, or operate any solid waste management facility without first obtaining certification from the secretary for such facility, site, or activity, except for sludge or septage treatment or storage facilities located within the fenced area of a domestic wastewater treatment plant permitted under chapter 47 of this title. This exemption for sludge or septage treatment or storage facilities shall exist only if:

(A) the treatment facility does not utilize a process to further reduce pathogens in order to qualify for marketing and distribution; and

(B) the facility is not a drying bed, lagoon, or nonconcrete bunker; and

(C) the owner of the facility has submitted a sludge and septage management plan to the secretary and the secretary has approved the plan.

Noncompliance with an approved sludge and septage management plan shall constitute a violation of the terms of this chapter, as well as a violation under chapters 201 and 211 of this title.

(2) Certification shall be valid for a period not to exceed ten years. (b) Certification for a solid waste management facility, where appropriate, shall:

(1) Specify the location of the facility, including limits on its development;

(2) Require proper operation and development of the facility in accordance with the engineering plans approved under the certificate;

(3) Specify the projected amount and types of waste material to be disposed of at the facility, which, in case of landfills and incinerators, shall include the following:

(A) if the waste is being delivered from a municipality that has an approved implementation plan, hazardous materials and recyclables shall be removed from the waste according to the terms of that implementation plan;

(B) if the waste is being delivered from a municipality that does not have an approved implementation plan, leaf and yard residuals shall be removed from the waste stream, and 100 percent of each of the following shall be removed from the waste stream: mandated recyclables, hazardous waste from households, and hazardous waste from small quantity generators;

(4) Specify the type and numbers of suitable pieces of equipment that will operate the facility properly;

(5) Contain provisions for air, groundwater, and surface water monitoring throughout the life of the facility and provisions for erosion control, capping, landscaping, drainage systems, and monitoring systems for leachate and gas control;

(6) Contain such additional conditions, requirements, and restrictions as the secretary may deem necessary to preserve and protect the public health and the air, groundwater and surface water quality. This may include~~, but is not limited to,~~ requirements concerning reporting, recording, and inspections of the operation of the site.

(c) The secretary shall not issue a certification for a new facility or renewal for an existing facility, except for a sludge or septage land application project, unless it is included in an implementation plan adopted pursuant to 24 V.S.A. § 2202a, for the area in which the facility is located.

* * *

(j) A facility certified under this section that offers the collection of solid waste shall:

(1) Beginning July 1, 2014, collect mandated recyclables separate from other solid waste and deliver mandated recyclables to a facility maintained and operated for the management and recycling of mandated recyclables. A facility shall not be required to accept mandated recyclables from a commercial hauler.

(2) Beginning July 1, 2015, collect leaf and yard residuals separate from other solid waste and deliver leaf and yard residuals to a location that manages leaf and yard residuals in a manner consistent with the priority uses established under subdivisions 6605k(a)(3)–(5) of this title.

(3) Beginning July 1, 2017, collect food residuals separate from other solid waste and deliver food residuals to a location that manages food residuals in a manner consistent with the priority uses established under subdivisions 6605k(a)(2)–(5) of this title.

(k) The secretary may, by rule, adopt exemptions to the requirements of subsection (j) of this section, provided that the exemption is consistent with the purposes of this chapter and the objective of the state plan.

(l) A facility certified under this section that offers the collection of solid waste shall not charge a separate fee for the collection of mandated recyclables. A facility certified under this section may incorporate the cost of the collection of mandated recyclables into the cost of the collection of solid waste and may adjust the charge for the collection of solid waste. A facility certified under this section may charge a separate fee for the collection of leaf and yard residuals or food residuals. If a facility collects mandated recyclables from a commercial hauler, the facility may charge a fee for the collection of those mandated recyclables.

Sec. 5. 10 V.S.A. § 6605c is amended to read:

§ 6605c. SOLID WASTE CATEGORICAL CERTIFICATIONS

* * *

(b) The secretary may, by rule, list certain solid waste categories as eligible for certification pursuant to this section:

(1) Solid waste categories to be deposited in a disposal facility shall not be a source of leachate harmful to human health or the environment.

(2) Solid waste categories to be managed in a composting facility shall not present an undue threat to human health or the environment.

(3) Recyclable materials either recycled or prepared for recycling at a recycling facility.

* * *

Sec. 6. 10 V.S.A. § 6605k is added to read:

§ 6605k. FOOD RESIDUALS; MANAGEMENT HIERARCHY

(a) It is the policy of the state that food residuals collected under the requirements of this chapter shall be managed according to the following order of priority uses:

(1) Reduction of the amount generated at the source;

(2) Diversion for food consumption by humans;

(3) Diversion for agricultural use, including consumption by animals;

(4) Composting, land application, and digestion; and

(5) Energy recovery.

(b) A person who produces more than an amount identified under subsection (c) of this section in food residuals and is located within 20 miles of a certified organics management facility that has available capacity and that is willing to accept the food residuals shall:

(1) Separate food residuals from other solid waste, provided that a de minim is amount of food residuals may be disposed of in solid waste when a person has established a program to separate food residuals and the program includes a component for the education of program users regarding the need to separate food residuals; and

(2) Arrange for the transfer of food residuals to a location that manages food residuals in a manner consistent with the priority uses established under subdivisions (a)(2)–(5) of this section or shall manage food residuals on site.

(c) The following persons shall be subject to the requirements of subsection(b) of this section:

(1) Beginning July 1, 2014, a person whose acts or processes produce more than 104 tons per year of food residuals;

(2) Beginning July 1, 2015, a person whose acts or processes produce more than 52 tons per year of food residuals;

(3) Beginning July 1, 2016, a person whose acts or processes produce more than 26 tons per year of food residuals;

(4) Beginning July 1, 2017, a person whose acts or processes produce more than 18 tons per year of food residuals; and

(5) Beginning July 1, 2020, any person who generates any amount of food residuals.

Sec. 7. 10 V.S.A. § 6605l is added to read:

§ 6605l. PUBLIC COLLECTION CONTAINERS FOR SOLID WASTE

(a) As used in this section:

(1) "Public building" means a state, county, or municipal building, airport terminal, bus station, railroad station, school building, or school.

(2) "Public land" means all land that is owned or controlled by a municipal or state governmental body.

(b) Beginning July 1, 2015, when a container or containers in a public building or on public land are provided to the public for use for solid waste destined for disposal, an equal number of containers shall be provided for the collection of mandated recyclables. The containers shall be labeled to clearly show the containers are for recyclables and shall be placed as close to each other as possible in order to provide equally convenient access to users. Bathrooms in public buildings and on public land shall be exempt from the requirement of this section to provide an equal number of containers for the collection of mandated recyclables.

Sec. 8. 10 V.S.A. § 6607a is amended to read:

§ 6607a. WASTE TRANSPORTATION

(a) A commercial hauler desiring to transport waste within the state shall apply to the secretary for a permit to do so, by submitting an application on a form prepared for this purpose by the secretary and by submitting the disclosure statement described in section 6605f of this title. These permits shall have a duration of five years-and shall be renewed annually. The application shall indicate the nature of the waste to be hauled. The secretary may specify conditions that the secretary deems necessary to assure compliance with state law.

* * *

(g)(1) Except as set forth in subdivisions (2) and (3) of this subsection, a transporter certified under this section that offers the collection of solid waste shall:

(A) Beginning July 1, 2015, offer to collect mandated recyclables separated from other solid waste and deliver mandated recyclables to a facility maintained and operated for the management and recycling of mandated recyclables.

(B) Beginning July 1, 2016, offer to collect leaf and yard residuals separate from other solid waste and deliver leaf and yard residuals to a location that manages leaf and yard residuals in a manner consistent with the priority uses established under subdivisions 6605k(a)(3)–(5) of this title.

(C) Beginning July 1, 2017, offer collection of food residuals separate from other solid waste and deliver to a location that manages food residuals in a manner consistent with the priority uses established under subdivisions 6605k(a)(2)–(5) of this title.

(2) In a municipality that has adopted a solid waste management ordinance addressing the collection of mandated recyclables, leaf and yard residuals, or food residuals, a transporter in that municipality is not required to comply with the requirements of subdivision (1) of this subsection and subsection (h) of this section for the material addressed by the ordinance if the ordinance:

(A) is applicable to all residents of the municipality;

(B) prohibits a resident from opting out of municipally provided solid waste services; and

(C) does not apply a variable rate for the collection for the material addressed by the ordinance.

(3) A transporter is not required to comply with the requirements of subdivision (1)(B) or (C) of this subsection in a specified area within a municipality if:

(A) the secretary has approved a solid waste implementation plan for the municipality;

(B) the approved plan delineates an area where solid waste management services required by subdivision (1)(B) or (C) of this subsection are not required; and

(C) in the delineated area, alternatives to the services, including onsite management, required under subdivision (1)(B) or (C) are offered, the alternative services have capacity to serve the needs of all residents in the delineated area, and the alternative services are convenient to residents of the delineated area.

(h) A transporter certified under this section that offers the collection of solid waste may not charge a separate line item fee on a bill to a residential customer for the collection of mandated recyclables, provided that a transporter may charge a fee for all service calls, stops, or collections at a residential property and a transporter may charge a tiered or variable fee based on the size of the collection container provided to a residential customer or the amount of waste collected from a residential customer. A transporter certified under this section may incorporate the cost of the collection of mandated recyclables into the cost of the collection of solid waste and may adjust the charge for the collection of solid waste. A transporter certified under this section that offers the collection of solid waste may charge a separate fee for the collection of leaf and yard residuals or food residuals from a residential customer.

Sec. 9. 10 V.S.A. § 6613 is amended to read:

§ 6613. VARIANCES

(a) A person who owns or is in control of any plant, building, structure, process, or equipment may apply to the secretary for a variance from the rules adopted under this chapter. The secretary may grant a variance if he or she finds that:

(1) The variance proposed does not endanger or tend to endanger human health or safety.

(2) Compliance with the rules from which variance is sought would produce serious hardship without equal or greater benefits to the public.

(3) The variance granted does not enable the applicant to generate, transport, treat, store, or dispose of hazardous waste in a manner which is less stringent than that required by the provisions of Subtitle C of the Resource Conservation and Recovery Act of 1976, and amendments thereto, codified in 42 U.S.C. Chapter 82, subchapter 3, and regulations promulgated under such subtitle.

(b) A person who owns or is in control of any facility may apply to the secretary for a variance from the requirements of subdivision 6605(j)(2) or (3) of this title if the applicant demonstrates alternative services, including on-site management, are available in the area served by the facility, the alternative services have capacity to serve the needs of all persons served by the facility requesting the variance, and the alternative services are convenient to persons served by the facility requesting the variance.

(c) No variance shall be granted pursuant to this section except after public notice and an opportunity for a public meeting and until the secretary has considered the relative interests of the applicant, other owners of property likely to be affected, and the general public.

~~(c)~~(d) Any variance or renewal thereof shall be granted within the requirements of subsection (a) of this section and for time periods and under conditions consistent with the reasons therefor, and within the following limitations:

(1) If the variance is granted on the ground that there is no practicable means known or available for the adequate prevention, abatement, or control of the air and water pollution involved, it shall be only until the necessary practicable means for prevention, abatement, or control become known and available, and subject to the taking of any substitute or alternate measures that the secretary may prescribe.

(2) If the variance is granted on the ground that compliance with the particular requirement or requirements from which variance is sought will necessitate the taking of measures which, because of their extent or cost, must be spread over a considerable period of time, it shall be for a period not to exceed such reasonable time as, in the view of the secretary, is requisite for the taking of the necessary measures. A variance granted on the ground specified herein shall contain a time schedule for the taking of action in an expeditious manner and shall be conditioned on adherence to the time schedule.

(3) If the variance is granted on the ground that it is justified to relieve or prevent hardship of a kind other than that provided for in subdivisions (1) and (2) of this subsection, it shall be for not more than one year, except that in the case of a variance from the siting requirements for a solid waste management facility, the variance may be for as long as the secretary determines necessary, including a permanent variance.

(e) Any variance granted pursuant to this section may be renewed on terms and conditions and for periods, which would be appropriate on initial granting of a variance. If a complaint is made to the secretary on account of the variance, no renewal thereof shall be granted, unless following public notice and an opportunity for a public meeting on the complaint, the secretary finds that renewal is justified. No renewal shall be granted except on application therefore. The application shall be made at least 60 days prior to the expiration of the variance. Immediately upon receipt of an application for renewal, the secretary shall give public notice of the application.

(f) A variance or renewal shall not be a right of the applicant or holder thereof but shall be in the discretion of the secretary.

(g) This section does not limit the authority of the secretary under section 6610 of this title concerning imminent hazards from solid waste, nor under section 6610a of this title concerning hazards from hazardous waste and violations of statutes, rules, or orders relating to hazardous waste.

Sec. 10. 10 V.S.A. § 6621a is amended to read:

§ 6621a. LANDFILL DISPOSAL REQUIREMENTS

(a) In accordance with the following schedule, no person shall knowingly dispose of the following materials in solid waste or in landfills:

(1) Lead-acid batteries, after July 1, 1990.

(2) Waste oil, after July 1, 1990.

(3) White goods, after January 1, 1991. "White goods" include discarded refrigerators, washing machines, clothes dryers, ranges, water heaters, dishwashers, and freezers. Other similar domestic and commercial large appliances may be added, as identified by rule of the secretary.

(4) Tires, after January 1, 1992.

(5) Paint (whether water based or oil based), paint thinner, paint remover, stains, and varnishes. This prohibition shall not apply to solidified water based paint in quantities of less than one gallon, nor shall this prohibition apply to solidified water based paint in quantities greater than one gallon if those larger quantities are from a waste stream that has been subject to an effective paint reuse program, as determined by the secretary.

(6) Nickel-cadmium batteries, small sealed lead acid batteries, nonconsumer mercuric oxide batteries, and any other battery added by the secretary by rule.

(7)(A) Labeled mercury-added products on or before July 1, 2007.

(B) Mercury-added products, as defined in chapter 164 of this title, after July 1, 2007, except as other effective dates are established in that chapter.

(8) Banned electronic devices. After January 1, 2011, computers; peripherals; computer monitors; cathode ray tubes; televisions; printers; personal electronics such as personal digital assistants and personal music players; electronic game consoles; printers; fax machines; wireless telephones; telephones; answering machines; videocassette recorders; digital versatile disc players; digital converter boxes; stereo equipment; and power supply cords (as used to charge electronic devices).

(9) Mandated recyclable materials after July 1, 2015.

(10) Leaf and yard residuals and wood waste after July 1, 2016.
(11) Food residuals after July 1, 2020.

(b) This section shall not prohibit the designation and use of separate areas at landfills for the storage or processing, or both, of material specified in this section.

(c) Insofar as it applies to the operator of a solid waste management facility, the secretary may suspend the application of this section to material specified in subdivisions (a)(2), (3), (4), (5), or (6) of this section, or any combination of these, upon finding that insufficient markets exist and adequate uses are not reasonably available to serve as an alternative to disposal.

Sec. 11. 24 V.S.A. § 2202a is amended to read:

§ 2202a. MUNICIPALITIES—RESPONSIBILITIES FOR SOLID WASTE

(a) Municipalities are responsible for the management and regulation of the storage, collection, processing, and disposal of solid wastes within their jurisdiction in conformance with the state solid waste management plan authorized under 10 V.S.A. chapter 159 ~~of Title 10~~. Municipalities may issue exclusive local franchises and may make, amend, or repeal rules necessary to manage the storage, collection, processing, and disposal of solid waste materials within their limits and impose penalties for violations thereof, provided that the rules are consistent with the state plan and rules adopted by the secretary of the agency of natural resources under 10 V.S.A. chapter 159. A fine may not exceed $1,000.00 for each violation. This section shall not be construed to permit the existence of a nuisance.

(b) Municipalities may satisfy the requirements of the state solid waste management plan and the rules of the secretary of the agency of natural resources through agreement between any other unit of government or any operator having a permit from the secretary, as the case may be.

(c)(1) No later than July 1, 1988 each municipality, as defined in subdivision 4303(12) of this title, shall join or participate in a solid waste management district organized pursuant to chapter 121 of this title no later than January 1, 1988 or participate in a regional planning commission's planning effort for purposes of solid waste implementation planning, as implementation planning is defined in 10 V.S.A. § 6602.

(2) No later than July 1, 1990 each regional planning commission shall work on a cooperative basis with municipalities within the region to prepare a solid waste implementation plan for adoption by all of the municipalities within the region which are not members of a solid waste district, that conforms to the state waste management plan and describes in detail how the region will achieve the priorities established by 10 V.S.A. § 6604(a)(1). A solid waste implementation plan adopted by a municipality that is not a member of a district shall not in any way require the approval of a district. No later than July 1, 1990 each solid waste district shall adopt a solid waste implementation plan that conforms to the state waste management plan, describes in detail how the district will achieve the priorities established by 10 V.S.A. § 6604(a)~~(1)~~, and is in conformance with any regional plan adopted pursuant to chapter 117 of this title. Municipalities or solid waste management districts that have contracts in existence as of January 1, 1987, which contracts are inconsistent with the state solid waste plan and the priorities established in 10 V.S.A. § 6604(a)~~(1)~~, shall not be required to breach those contracts, provided they make good faith efforts to renegotiate those contracts in order to comply. The secretary may extend the deadline for completion of a plan upon finding that despite good faith efforts to comply, a

regional planning commission or solid waste management district has been unable to comply, due to the unavailability of planning assistance funds under 10 V.S.A. § 6603b(a) or delays in completion of a landfill evaluation under 10 V.S.A.§ 6605a.

(3) A municipality that does not join or participate as provided in this subsection shall not be eligible for state funds to plan and construct solid waste facilities, nor can it use facilities certified for use by the region or by the solid waste management district.

(4) A regional plan or a solid waste implementation plan shall include a component for the management of nonregulated hazardous wastes.

(A) At the outset of the planning process for the management of nonregulated hazardous wastes and throughout the process, solid waste management districts or regional planning commissions, with respect to areas not served by solid waste management districts, shall solicit the participation of owners of solid waste management facilities that receive mixed solid wastes, local citizens, businesses, and organizations by holding informal working sessions that suit the needs of local people. At a minimum, an advisory committee composed of citizens and business persons shall be established to provide guidance on both the development and implementation of the nonregulated hazardous waste management plan component.

(B) The regional planning commission or solid waste management district shall hold at least two public hearings within the region or district after public notice on the proposed plan component or amendment.

(C) The plan component shall be based upon the following priorities, in descending order:

(i) The elimination or reduction, whenever feasible, in the use of hazardous, particularly toxic, substances.

(ii) Reduction in the generation of hazardous waste.

(iii) Proper management of household and exempt small quantity generator hazardous waste.

(iv) Reduction in the toxicity of the solid waste stream, to the maximum extent feasible in accordance with the priorities of 10 V.S.A.§ 6604(a)(1).

(D) At a minimum, this plan component shall include the following:

(i) An analysis of preferred management strategies that identifies advantages and disadvantages of each option.

(ii) An ongoing educational program for schools and households, promoting the priorities of this subsection.

(iii) An educational and technical assistance program for exempt small quantity generators that provides information on the following: use and waste reduction; preferred management strategies for specific waste streams; and collection, management and disposal options currently or potentially available.

(iv) A management program for household hazardous waste.

(v) A priority management program for unregulated hazardous waste streams that present the greatest risks.

(vi) A waste diversion program element, that is coordinated with any owners of solid waste management facilities and is designed to remove unregulated hazardous waste from the waste stream entering solid waste facilities and otherwise to properly manage unregulated hazardous waste. (vii) A waste management system established for all the waste streams banned from landfills under 10 V.S.A. § 6621a.

(E) For the purposes of this subsection, nonregulated hazardous wastes include hazardous wastes generated by households and exempt small quantity generators as defined in the hazardous waste management regulations adopted under 10 V.S.A. chapter 159.

(d) By no later than July 1, 2015, a municipality shall implement a variable rate pricing system that charges for the collection of municipal solid waste from a residential customer for disposal based on the volume or weight of the waste collected.

(e) The education and outreach requirements of this section need not be met through direct mailings, but may be met through other methods such as television and radio advertising; use of the Internet, social media, or electronic mail; or the publication of informational pamphlets or materials.

Sec. 12. ANR REPORT ON SOLID WASTE

(a) On or before November 1, 2013, the secretary of natural resources shall submit to the house and senate committees on natural resources and energy a report addressing solid waste management in the state. At a minimum, the report shall include:

(1) Waste analysis. An analysis of the volume and nature of wastes generated in the state, the sources of those wastes, and the current fate or disposition of those wastes. This analysis shall include:

(A) the results of a waste composition study;

(B) to the extent possible, an analysis of the quantities and types of materials received at recycling facilities, the contamination levels of materials received at recycling facilities, and the final disposition of materials received by recycling facilities; and

(C) an analysis of the effectiveness of the existing, statutory beverage container deposit and return requirements and the effectiveness of the existing, statutory requirements in 10 V.S.A. chapters 164 (mercury management), 164A (collection and disposal of mercury containing lamps), and 166 (collection and recycling of electronic devices) in achieving the priorities and goals established by the state solid waste management plan.

(2) Cost analysis.

(A) An estimate of the cost of implementation of the existing solid waste management system for the state, including to the extent possible, the cost to consumers, avoided costs, and foreseeable future costs;

(B) An estimate of the cost of managing individual categories of solid waste as that term is defined in 10 V.S.A. § 6604(a)(2)(B);

(C) An estimate of the costs, cost savings, increased efficiencies, and economic opportunities attendant to the diversion of solid waste categories;

(3) Local governance analysis. An analysis of the services provided by municipalities responsible for the management and regulation of the storage, collection, processing, and disposal of solid waste under 24 V.S.A. § 2202a. The analysis shall summarize:

(A) The organizational structure municipalities use to provide solid waste services, including the number of solid waste districts in the state and the number of towns participating in a solid waste district;

(B) The type of solid waste services provided by municipalities, including the categories of solid waste collected and the disposition of collected solid waste;

(C) The effectiveness of those facilities and programs in achieving the priorities and goals established by the state solid waste plan; and

(D) The cost-effectiveness of solid waste services provided by municipalities.

(4) Infrastructure analysis.

(A) An assessment of facilities and programs necessary at the state, regional, or local level to achieve the priorities and the goals established in the state solid waste plan, including, after consultation with the secretary of agriculture, food and markets, an estimate of the number and type of composting facilities on farms.

(B) An estimate of the landfill capacity available in Vermont and an estimated time at which there will be no landfill capacity remaining in the state.

(C) An assessment of the status, capacity, and life expectancy of existing solid waste management facilities.

(D) An estimate of the cost of infrastructure necessary for the mandatory recycling of categories of solid waste.

(5) Natural resources and environmental analysis.

(A) A general, narrative summary or assessment of the natural resources and environmental impacts of current solid waste management practices on air quality, greenhouse gas emissions, and water quality.

(B) A general, narrative summary of how litter or improper disposal or management of solid waste impacts scenic or aesthetic resources.

(6) Legislative recommendation. Recommendations for amending solid waste management practices in the state, including recommended legislative or regulatory changes to promote the reduction in solid waste generation and to increase recycling and diversion of solid waste. Recommendations submitted under this subdivision shall include a summary of the rationale for the recommendation and a general, narrative summary of the costs and benefits of the recommended action.

(b) In preparing the report required by subsection (a) of this section, the secretary shall consult with interested persons, including the secretary of agriculture, food and markets,

manufacturers, recyclers, collectors, retailers, solid waste districts, and environmental groups.

Sec. 13. REPEAL

10 V.S.A. § 7113 (advisory committee on mercury pollution) is repealed.

Sec. 14. AGENCY OF NATURAL RESOURCES REPORT OF WASTE TIRE MANAGEMENT AND DISPOSAL

On or before January 15, 2013, the secretary of natural resources shall submit to the house and senate committees on natural resources and energy a report regarding the management of waste tires within the state. The report shall include:

(1) An inventory of sites in the state where the secretary determines, in his or her discretion, that the disposal, management, or disposition of waste tires is a problem.

(2) An estimate of the number of waste tires disposed of or stored at the problem sites identified under subdivision (1) of this section.

(3) An estimate of how much it would cost to properly dispose of or arrange for the final disposition of the number of waste tires estimated under subdivision (2) of this section.

(4) An estimate of the amount of time required for the proper disposal or final disposition of the number of waste tires estimated under subdivision (2) of this section.

Sec. 15. 10 V.S.A. § 6618(b) is amended to read:

(b) The secretary may authorize disbursements from the solid waste management assistance account for the purpose of enhancing solid waste management in the state in accordance with the adopted waste management plan. This includes:

* * *

(10) the costs of the proper disposal of waste tires. Prior to disbursing funds under this subsection, the secretary shall provide a person with notice and opportunity to dispose of waste tires properly. The secretary may condition a disbursement under this subsection on the repayment of the disbursement. If a person fails to provide repayment subject to the terms of a disbursement, the secretary may initiate an action against the person for repayment to the fund or may record against the property of the person a lien for the costs of cleaning up waste tires at a property.

* * * Collection and Recycling of Electronic Devices * * *

Sec. 16. 10 V.S.A. § 7551 is amended to read:

§ 7551. DEFINITIONS.

For the purposes of this chapter:

* * *

(4) "Collector" means a public or private entity that receives electronic waste from covered entities, or from another collector and that performs any of the following:

(A) arranges for the delivery of the electronic waste to a recycler.

(B) sorts electronic waste.

(C) consolidates electronic waste.

(D) provides data security services in a manner approved by the secretary.

(5) "Computer" means an a laptop computer, desktop computer, tablet computer, or central processing unit that conveys electronic, magnetic, optical, electrochemical, or other high-speed data processing device performing logical, arithmetic, or storage functions; "Computer" does not include an automated typewriter or typesetter or other similar device.

* * *

(8) "Covered electronic device" means a: computer; computer monitor; device containing a cathode ray tube; printer; or television from a covered entity. "Covered electronic device" does not include: any motor vehicle or any part thereof; a camera or video camera; a portable or stationary radio; a wireless telephone; a household appliance, such as a clothes washer, clothes dryer, water heater, refrigerator, freezer, microwave oven, oven, range, or dishwasher; equipment that is functionally or physically part of a larger piece of equipment intended for use in an industrial, research and development, or commercial setting; security or anti-terrorism equipment; monitoring and control instruments or systems; thermostats; hand-held transceivers; a telephone of any type; a portable digital assistant or similar device; a calculator; a global positioning system receiver or similar navigation device; commercial medical equipment that contains a cathode ray tube, a cathode ray tube device, a flat panel display, or similar video display that is not separate from the larger piece of equipment; or other medical devices, as the term "device" is defined under 21 U.S.C. § 321(h) of the Federal Food, Drug, and Cosmetic Act, as that section is amended from time to time.

(9) "Covered entity" means any household, charity, or school district in the state; or a business in the state that employs ten or fewer individuals. If seven or fewer covered electronic devices are delivered to a collector at any given time, those devices shall be presumed to be from a covered entity.

(10) "Electronic waste" means a: computer; computer monitor; computer peripheral; device containing a cathode ray tube; printer; or television from a covered entity. "Electronic waste" does not include: any motor vehicle or any part thereof; a camera or video camera; a portable or stationary radio; a wireless telephone; a household appliance, such as a clothes washer, clothes dryer, water heater, refrigerator, freezer, microwave oven, oven, range, or dishwasher; equipment that is functionally or physically part of a larger piece of equipment intended for use in an industrial, library, research and development, or commercial setting; security or antiterrorism equipment; monitoring and control instruments or systems; thermostats; handheld transceivers; a telephone of any type; a portable digital assistant or similar device; a calculator; a global positioning system receiver or similar navigation device; commercial medical equipment that contains a cathode ray tube, a cathode ray tube device, a flat panel display, or similar video display that is not separate from the larger piece of equipment; or other medical devices, as the term "device" is defined

under 21 U.S.C. § 321(h) of the Federal Food, Drug, and Cosmetic Act, as that section is amended from time to time.

* * *

(12) "Market share" means a "manufacturer's market share" which shall be the manufacturer's percentage share of the total weight of covered electronic devices sold in the state as determined by an estimate of the aggregate total weight of the manufacturer's covered electronic devices sold in the state during the previous program year based on national sales data unless the secretary approves a manufacturer to use actual sales data.

* * *

(14) "Program year" means the period established by the secretary as the program year in the plan required by section 7552 of this title.

* * *

(20) "Transporter" means a person that moves electronic waste from a collector to either another collector or to a recycler.

* * * Study of Expansion of Beverage Container Redemption System * * *

Sec. 17. [Deleted]

Sec. 18. ANR REPORT ON THE COSTS AND BENEFITS OF

EXPANSION OF THE BEVERAGE CONTAINER REDEMPTION SYSTEM

Report on costs on bottle bill. On or before November 1, 2013, the secretary of natural resources shall submit to the senate and house committees on natural resources and energy, the senate committee on economic development, housing and general affairs, and the house committee on commerce a report regarding the costs and benefits of expanding the beverage container redemption system to include containers for all noncarbonated drinks. The report shall include:

(1) An estimate of the cost of implementing the existing beverage container redemption system;

(2) An estimate of the cost of implementing expansion of the beverage container redemption system to include containers for all noncarbonated drinks, including an estimate of the commodity value lost by municipalities due to diversion of recyclable material from single-stream recycling programs.

(3) An estimate of the cost of implementing a zero-sort, single-stream recycling program.

(4) A summary of the total recycling benefits of a single-stream recycling program in contrast to the beverage container redemption system.

(5) A recommendation from the secretary as to whether the beverage container redemption system should be expanded, remain unchanged, or be repealed.

Sec. 18a. STATE HOUSE RECYCLING PROGRAM

On or before July 1, 2012, the sergeant at arms shall establish a program for the recycling of mandated recyclables, as that term is defined in 10 V.S.A § 6602. Under the program required by this section, when a container or containers are provided in the state house for the

collection of solid waste destined for disposal, a container shall be provided for the collection of mandated recyclables. The program required by this section shall provide for the recycling of all mandated recyclables. Bathrooms in the state house shall be exempt from the requirement to provide an equal number of containers for the collection of mandated recyclables.

* * * Appeals, Enforcement, and Effective Dates * * *

Sec. 19. 10 V.S.A. § 8003(a) is amended to read:

(a) The secretary may take action under this chapter to enforce the following statutes and rules, permits, assurances, or orders implementing the following statutes:

* * *

(21) 10 V.S.A. chapter 166, relating to collection and recycling of electronic waste;

(22) 10 V.S.A. chapter 164A, collection and disposal of mercury-containing lamps;

(23) 24 V.S.A. § 2202a, relating to a municipality's adoption and implementation of a solid waste implementation plan that is consistent with the state solid waste plan.

Sec. 20. 10 V.S.A. § 8503 is amended to read:

§ 8503. APPLICABILITY

(a) This chapter shall govern all appeals of an act or decision of the secretary, excluding enforcement actions under chapters 201 and 211 of this title and rulemaking, under the following authorities and under the rules adopted under those authorities:

* * *

(g) This chapter shall govern all appeals of an act or decision of the secretary of natural resources that a solid waste implementation plan for a municipality proposed under 24 V.S.A. § 2202a conforms with the state solid waste implementation plan adopted pursuant to section 6604 of this title.

Sec. 21. EFFECTIVE DATE

This act shall take effect on July 1, 2012.

Approved: May 16, 2012.

APPENDIX E

**FCC Asset Mapping Tool, Update of top ten strategies (submitted by Pat Sagui, FCC Organizer)**

*1. Fund & develop regional strategic planning sessions. Focal areas of (1) investments and communication and (2) regional Universal Recycling implementation networks.*
We are moving towards this through the FCC with the Regional Food Rescue Assessment Tool.

*2. Develop an awareness and statewide messaging and marketing program. Give developed materials to groups to regionalize and disseminate. Target food system actors for dissemination through their existing networks. Survey the general public and stakeholder constituents to establish a benchmark for Universal Recycling awareness, and periodically resurvey groups to measure success of messaging and marketing.*
The state and the Food Bank are in the final stages of drafting materials regarding food rescue. Food Bank is working on a packet of materials for independent grocers. FCC spearheaded the production of a short video (needs final editing) to be part of the materials for grocers.

*3. Develop a marketplace strategy for composting infrastructure and demand for compost products*
*4. Replicate the Willing Hands model in order to develop greater regional food rescue capacity*
Four Middlebury College students are doing preliminary research and interviewing that we expect will provide solid evidence for developing a replicable model. Next step is to develop a Regional Food Rescue Assessment Tool for replicating a regional approach like Willing Hands.

*5. Conduct nutritional & economic analysis for regional diversion pathways*
*6. Build capacity of local charitable food sites*
Met with reps from USDA about the need for refrigeration to expand capacity. That's the next barrier to overcome. The Food Bank expressed interest in applying for a grant for refrigerators and freezers. USDA affirmed that they would be a credible applicant.

*7. Inform financiers, funders, and policymakers of economic risks and opportunities presented by Universal Recycling*
*8. Survey composters and towns to identify carbon sources—both the sources that are already being used and those that could function as carbon sources for composting facilities.*
*9. Develop community-based rescue systems for prepared foods at institutions, restaurants, etc.*
*10. One-stop shop for how to manage food resources (rescued, compostable foods, etc.) that includes an online exchange/marketplace.*

APPENDIX F


**Additional WWII propaganda poster**.

*Figure 14: WWII Propaganda poster (circa 1942-1943)*
*Source: http://www.fareshare.org.uk/100-years-of-food-waste/*

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